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ABSTRACT

This report provides research on the ramifications of implementing computer-assisted instruction (CAI) within the established framework for conducting adult basic education. The first part is narrative beginning with an historical overview of CAI. Topics include the availability of computer hardware in public schools, teacher preparation for CAI, and the role of computers in educational settings. CAI is defined, and theoretical and research support for CAI is presented. The project setting and unanticipated consequences are then described. The courseware selected is listed, and learner and instructor responses to the types of courseware available are reported. Other sections discuss nontraditional and traditional instructional strategies using CAI, integration of CAI, attitudes of students and instructors toward CAI, and outcomes. The second part of the report is a compilation of courseware that may be appropriate for GED preparation. They are arranged by these subject areas: writing skills, social studies, science, reading skills, and mathematics/basic skills. Each description provides a title, an annotation, a computer model, and costs. Courseware choices for a limited budget are arranged by computer model. A list of courseware descriptions for adult basic education programming is also included. (YLB)

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MICROCOMPUTERS/ADULT BASIC EDUCATION: A PROJECT DIRECTED AT IMPLEMENTING CAI FOR ADULT LEARNERS AND IDENTIFYING COURSEWARE FOR GED/ABE PROGRAMS

DANIEL M. PAUL
PROJECT DIRECTOR

Developed By

THE SHENANDOAH VALLEY SCHOOL DISTRICT
INTERMEDIATE UNIT NO. 29
as part of a grant from
The Pennsylvania Department of Education
Division of Adult Education and Training Programs

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REPORT NO. 1

Implementing Computer Assisted Instruction in Adult Basic Education Programming: Observations in a Rural Setting

by

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REPORT NO. 2

Selected Courseware for GED/ABE Programming

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Developed by

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Intermediate Unit No. 29

as part of a grant from
The Pennsylvania Department of Education
Division of Adult Education and Training Programs

DISCLAIMER

This project was supported in whole or in part by the United States Department of Education through the Pennsylvania Department of Education, Division of Adult Education and Training Programs, as a Section 310 Special Project Grant. However, the opinions expressed herein do not necessarily reflect the position or policy of the United States Department of Education, Pennsylvania Department of Education, or the Division of Adult Education and Training Programs and no official endorsement should be inferred.

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Special mention of the Adult Basic Education instructional staff who expended additional time and energy in implementing computer-assisted instruction for adult learners is in order. Without their dedication to the goals of this project, an insight into the advantages and disadvantages of computer-assisted instruction for adult learners would not have been possible. Appreciation is expressed to: Ms. Carol Mack, Ms. Eleanor Bauser, Ms. Diane Boczkowski, and Mr. Edward Chowanes.

In addition, appreciation is extended to Mr. Edward Chowanes for his effort in exploring the potential of the Exam Builder for its appropriateness in assessing GED type testing materials.

A special thanks is offered to both Dr. Ralph Morgan and Dr. James Fogarty at Intermediate Unit No. 29 for their effort on various aspects of this project.

SPECIAL RECOGNITION

Dr. Jonathan D. Kantrowitz has served as special consultant to this project. His thorough familiarity with current developments in educational courseware for microcomputers has made his insight into the possible selection of software for GED/ABE type programming extremely significant in terms of the overall quality of this project.

Although Dr. Kantrowitz was contracted specifically to identify appropriate.courseware for GED programming in order to assist adult learners prepare for the High School Equivalency Examination, at no additional cost for this project, he compiled a listing of programs appropriate for ABE programming. His extra effort will provide instructors in Adult Basic Education with a valuable resource.

Daniel M. Paul, Project Director
Shenandoah Valley School District
Shenandoah, Pennsylvania

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Introduction:

> Educators have shown increasing interest in the use of computers for classroom teaching, especially during the last year or two, and they have raised a number of fundamental questions that need analysis and discussion...Some of the most important questions are: How can the computer help in individualizing instruction? How might it change the teacher's role? How can teachers play a part in planning and using computers for instructional purposes? (Suppes, cited in Taylor, 1980, p.231).

Interestingly, this opening citation first appeared in an article written for NEA in 1967. Patrick Suppes, considered by many as "the father of computer assisted instruction," expressed concerns more than fifteen years earlier which are still being asked today. While certain problems and doubts related to the application of computer technology in instructional programming have remained rather consistent over the last two decades, other factors and conditions have radically changed: first, the new microcomputers are affordable and easy to use; second, indications show that school districts in increasing numbers are purchasing computers.

In a brief span of time we have witnessed a virtual technological revolution. "If the automobile business had developed like the computer business, a Rolls Royce would now cost $2.75 and run three million miles on a gallon of gasoline" (Tuman, 1983, p.60). Although some dramatic analogies are often used to emphasize the developments which have occurred within this electronic medium, in fact, advances made with integrated circuits have made it possible for most schools, teachers and students, to afford computer hardware.

> The marketing thrust of both the microcomputer manufactures and the microcomputer software producers has resulted in microcomputers which are simple to operate and software which demands as little expertise as possible on the part of the user (Burke, 1982, p.20).

A recent survey conducted by Johns Hopkins University indicated that a majority of school districts (53%) have at least one microcomputer for instructing students (CSOS, 1983).

As early as 1954 the United States Office of Education supported projects to test the appropriateness of computers in instructional programming. With assistance from the National Science Foundation and the Office of Education, approximately 200 colleges had established computer centers by 1962 (Poirot, 1980). However, these early efforts can be considered negligible in respect to their impact on public education. The excitement generated about using microcomputers today is more related to the sudden availability of inexpensive, powerful microcomputers and successful commercial efforts to market computer hardware and software than to demonstrated projects which convincingly establish the capability of this medium to present cost-effective programming.

> There is reason to be skeptical, for example, that the current... computers which many schools are purchasing are cost-effective devices for providing remedial drill and practice of basic math and language skills for which the commercial advertisements so willingly tout them...The potential capacity of computers to diagnose student error patterns and provide corrective tutorial instruction...have rarely been demonstrated in current microcomputer-based learning materials (Becker, 1982, p.2).

Dr. Fred O'Neal believes that there are several problems with typical research models directed at assessing the effectiveness of computer assisted instruction:

> CAI research is often necessarily incomplete in scope, dealing with delivery system, curriculum, or implementation concerns but seldom the combination of all three at one time (O'Neal, 1983, p.19).

This research project is directed at obtaining as complete a scope as possible on the ramifications of implementing computer assisted instruction within the established framework for conducting Adult Basic Education classes. Although an attempt is made to gain some understanding of delivery systems, curricula, and implementation problems as they place an impact on teachers and learners, other concerns expressed by O'Neal for improving the quality of CAI research could not be realized in this research project. As most research and development projects in CAI, limited (short-term) funding prevents a fuller appreciation of computer assisted instruction over an extended period.

> The short funding cycles generally prevalent result in endless repetitions of the first two or three years of a project's experience, whereas the opportunity to continue after the staff has been trained, after the materials and systems have been developed, tested, and refined, and after the initial mistakes have been made and exploratory research has been concluded has not generally been available (O'Neal, 1983, p. 19).

In addition, as with many research projects in education, problems related to controlling complex variables restrict the applications of true experimental test designs.

Although the period of observation for this project did not exceed 200 hours and controlling variables needed to establish internal and external validity necessary for generalization of results could not be maintained, there are aspects of this project which should prove useful to other educational agencies who are considering the use of computers to address certain needs of remedial adult learners.

Computers, per se, can not be evaluated any more than the television, tape recorder, and film projector can be determined as effective instructional devices (Jamison, Suppes, & Wells, 1974). We can examine a particular setting. We can gain some insights from the experiences obtained in certain sites; however, evaluations related to the effectiveness or ineffectiveness of computer assisted instruction relate only to that single experience and can not properly be generalized to the technique itself.

Historical Overview of CAI:

In 1950, five years after the arrival of the first electronic digital computer, the computer industry in the United States consisted of about twelve commercially produced models (UNIVAC) and approximately one-thousand programmers, operators, and analysts (Barnes, 1969). "The first computers," states Robert Burke (1982, p.16), "were more marvelous than useful." Still, the implications of this hardware for serving as an aid to instruction was not overlooked by those in the computer industry, and early instructional programs were designed for employee training in this field (O'Dea, 1971). Early program languages were typically designed by engineers who used them. They were complicated and difficult to comprehend by non-computer specialists. These "machine languages" operated on a binary number system which were tedious to develop and arbitrary. In order for any meaningful advances to be made in the application of computer technology in education, a program language would need to be developed which could be used by educators without the assistance of computer specialists. Coursewriter, designed by IBM in 1960, made this possible. In fact, during the late 50's and early 60's there were a series of projects initiated to facilitate the implementation of computer technology in education;

- In the early 60's Florida State University adapted Coursewriter in order to present college level courses in physics and statistics.
- Also, a new program language was being developed at Dartmouth University at this same time called BASIC--a compact program language which is easy-to-use, and ideal for beginning programmers.
- In 1959 researchers at the University of Illinois began designing a system for individualized instruction under the leadership of Donald Bitzer. This system was named Plato.

In 1963, the University of Stanford began to apply computer directed instruction specifically for mastery of basic skills for educationally disadvantaged learners. Patrick Suppes, who directed the Institute for the Mathematical Studies in the Social Sciences at that institution, originally envisioned the computer serving as a personal tutor for everyone: "every child could have the same advantage that Alexander the Great had--a personal tutor as brilliant, patient, and creative as Aristole" (cited in Coburn,et al, 1982, p.170). However, the magnitude of designing instructional programming to meet this goal was soon realized to be beyond their capacity. Therefore, Suppes and his coworkers directed their efforts toward a population which they believed could benefit most from this new technology; a technology which had the potential for offering specialized supplementary and/or individualized learning experiences. Suppes states about this project:

> Out of those efforts has grown a fairly widespread use in the United States of computer-based supplementary courses in elementary mathematical skills and concepts, basic reading skills, and language skills. These courses have been especially aimed at disadvantaged students who have been a central concern of the Elementary-Secondary Education Act of 1965....(Suppes, 1975)

The work at Stanford (Suppes focused on elementary mathematical skills while his colleague, Richard Atkinson, concentrated on basic reading skills) set the early models for developing drill and practice exercises for remedial instruction.

Other early efforts involved the Pennsylvania State University which in 1964 established computer laboratories to test and develop instructional applications of computer hardware.

Many of these initial efforts were strongly supported by the private sector. The Control Data Corporation subsidized development and maintenance of the PLATO system--the most extensive CAI time-shared network ever developed (Burke, 1982). In addition to its efforts in developing Coursewriter, IBM was responsible for designing the first computer system intended specifically for instructional applications. The IBM 1500 Model was used at several universities; each model 1500 was connected to a series of terminals (12 to 15) to form a time-share system.

Several projects conducted in public schools through the 60's and early 70's were notable. With support funding provided through Title III of the Elementary-Secondary Education Act (ESEA) of 1965, the McComb School District, Mississippi, became the first school system to offer drill and practice exercises with computers to all their elementary students. This project used terminals which were connected by telephone lines to the computer center at the University of Stanford. Beginning in 1971, the school system of Chicago implemented computer assisted instruction for both elementary and secondary students. Funds available through Title I (ESEA, 1965) were used to establish a comprehensive system which eventually involved 54 elementary and secondary buildings. This system provided remedial instruction in reading, math, and/or language arts for learners functioning below grade level. In total, this system provided service to approximately 10,000 students each academic year. The Kansas City Missouri Public Schools created computer laboratories which emphasized supplementary and enrichment materials for junior high students in the period 1966 to 1971.

Certainly, through the 60's and early 70's a major effort was made by universities, government agencies, and the private sector to develop the computer as an instructional tool. Literally, millions of dollars were allocated for program development. The impetus for this level of activity may be attributed to a series of factors. However, with the successful launching of Sputnik in 1957 by the USSR, public education in the United States was attacked through the media as inefficient and ineffective.

Schools were publically criticized for their failure to adopt efficient operational measures which characterized the administration of major businesses (Callahan, 1962). Schools were encouraged to pursue technical advances in order to modernize. "With much fanfare, an 'educational revolution' was declared, although its actual realization always seemed 'just around the corner'" (Coburn, et al, 1982, p. 169).

> The sixties can be thought of as a period of heavy investment in research and development in educational technology. Although the investment may yet pay off, the effort is generally thought of as having been a failure. Despite a rather extensive publicity campaign carried on in educational circles by the government, the computer manufacturers, and advocates of computer assisted instruction, none of this research had much immediate impact on mass education (Coburn, et al, 1982, p. 170).

It is difficult to simply state that experimental projects related to the application of computer hardware and software through the sixties and early seventies were a failure. The effort expended through this period may have contributed to the positive perception held in the educational community today towards the computer as an aid to instruction. The central problem, limiting the proliferation of computers in the early 70's, as defined in a study by the Educational Testing Service (ETS), was one of economics. The cost of hardware and software in order to provide computer assisted instruction to significant number of public school children was extremely too high (Anastasio, et al, 1972).

There were several interesting developments with computer technology form 1972 to 1977 which impacted on instructional design of courseware. Although most educators are aware that early computer models used in instructional settings were extremely expensive and difficult to maintain (requiring sufficient space for operation and a specialized staff of technicians), from an instructional point the terminals presented serious limitations. Early terminals were only able to present images which could be typed on a typewriter. The use of graphics, animations, color, sound, and lowercase lettering could not be employed. The advantages which a simple chalkboard offered to teachers could not be duplicated on the early terminals. Several solutions were used to overcome this pedagogical problem: reducing the distance from the computer to the terminal (using mobil vans) could improve the quality of the screen display; development of a "plasma panel terminal" made it possible to use standard telephone lines while maintaining fair screen definition on the terminal. The major innovation in this area could be attributed to the integrated circuit; screen quality was improved and telephone lines could be used without excessive cost. Ironically, this development also led to the production of a new generation of computers; the marketing of the microcomputer in 1977 by Commodore PET, followed quickly by Radio Shack and Apple, would "revolutionize" computer assisted instruction.

In addition to advances related to hardware through the seventies, courseware was further developed. In 1972 Brigham Young University began designing a new time-share program system called TICCIT--Time-shared Interactive, Computer-controlled Information Television. This system was designed to use less expensive minicomputers and standard color televisions. Unlike previously designed systems, this project was intended to allow local groups of educators more flexibility in terms of using available computer hardware and facilities. Also, in 1972 a program language called TUTOR was instrumental in the development of the PLATO IV System. Literally, thousands of instructional hours were programmed through this system covering an extensive number of academic disciplines, including a series of programs specifically directed at preparing adults who lack a high school diploma to successfully take the General Educational Development (GED) test.

One particular project initiated in 1972, which would have a major impact on expanding computer assisted instruction into public schools, was the formation of the Minnesota Educational Computing Consortium (MECC). The goal of this organization was to facilitate and coordinate the use of computers in elementary, secondary, and post-secondary institutions. It has been estimated that during the 1979-80 school year over 90% of students in Minnesota had some access to the MECC Timeshare System.

Federal support from the Office of Education and the National Science Foundation continued through the seventies; however, the prime obstacles identified by ETS in 1972 still were left unaddressed: the advantages of CAI could not overcome the cost of the technology. Many of the pilot projects which were undertaken with federal support were discontinued when the funds ran out (O'Neal, 1983). It is estimated that nearly two billion dollars have been spent on projects aimed at implementing computers in education by the Office of Education, The National Science Foundation, and universities. The cost of the investment made by the private sector is difficult to calculate, but the Control Data Corporation--responsible for the PLATO system--may have expended more than 800 million in product development since 1962 (Hayes, 1981).

"The history of computer usage is to some extent a story of the search for economy within a very expensive technology" (Burke, 1982, p. 17). While the technology was available since 1971 to build the microcomputer, it was not until 1977 that a major effort was launched to commercially develop this product. The traditional image that comes to mind of a huge computer system filling an entire room, requiring a dust free and temperature controlled environment, is referred to as a mainframe or maxi system. Produced by such manufactures as Honeywell, Sperry Univac, IBM, NCR, and Control Data; these models ranged in cost from $100,000 and up. By 1963 the mini systems (minicomputers) became commercially available. Major manufacturers like Hewlett-Packard, Data General, and Digital Equipment could establish a computer center for approximately one-tenth the cost of a mainframe system. The majority of test projects (cited in the literature) designed to evaluate the appropriateness of CAI were conducted on minicomputer systems using PLATO or TICCIT programs. A new wave of companies began to appear in 1975 including: Apple, Atari, Commodore, Compucolor, Ohio Scientific Instruments, Radio Shack, and Texas Instrument. Their product, while limited in storage capacity, could be purchased for one-tenth the cost of minicomputers: some models costed less than $1,000. Certain advantages of the microcomputer over minicomputer systems were quickly noticed:

> Terminals used with minicomputers cost the same as microcomputers but fail to provide the same degree of independence. If the central computer is damaged (a minicomputer would be connected to a series of terminals in a timeshared system) the entire system will shut-down. Maintenance and service costs are higher (Leventhal, 1981, p.228).

Irrespective of the investment of various agencies into CAI, and the claims of instructional advantages of computer technology in addressing certain educational objectives, it was not until the availability of affordable hardware that schools began implementing this technology for instructional purposes to any significant degree.

Availability of Computer Hardware in Public Schools:

The proliferation of computer dealerships and software venders have provided an indirect indication of the acceptance of this new technology in school districts; however, until recently, well documented data as to the number of computers available in public schools and their application within the general curriculum has not been clear. Over the last two years, several survey projects have provided reliable information in respect to the use of computer equipment in public education.

A survey of microcomputer usage in public schools was conducted by Quality Education Data in 1982. Data was obtained by telephoning every school in the United States; based on this procedure, they estimated that nearly 40% of school districts had microcomputers (Kantrowitz, 1982).

Published in April, 1983, the Center for Social Organization of Schools (Johns Hopkins University) indicated that 53% of all schools in the United States had at least one microcomputer. This survey relied on a stratified sampling involving over 2,000 school districts. Of special interest is the distribution of computers within school systems: 85% of secondary schools had computers, 77% of all junior-senior combinations and 68% of all middle and junior high schools had one or more microcomputers. It was also noted that between June, 1982, and January, 1983, nearly half the secondary schools that had not previously owned a microcomputer became equipped with one.

> Perhaps more significantly, the proportion of secondary schools that had five or more microcomputers nearly doubled during this period and now encompasses two-fifths of all Unitied States secondary schools (CSOS, 1983, p.3).

While the survey conducted by Quality Education Data and the Johns Hopkins University was designed to reflect the national trend, figures from industrial states demonstrate even wider acceptance of computers into public school systems. A recent survey conducted by Harry Benedetto and Simon Ju for the Pennsylvania Department of Education indicates significantly higher usage of computers in instructional programming than reflective of national trends. Their findings show that during the 1982/83 school year 82.5% of all school districts used microcomputers, 93% of all Intermediate Units, and 47% of all Area Vocational-Technical Schools. (Over 97% of all computers used in school districts were microcomputers rather than minicomputer systems). This survey provided some additional data which is rarely indicated in other survey projects. An attempt was make to identify the source of funding for the acquisition of microcomputers. It was observed that in nearly 40% of the school districts, federal funds were used (in part or in full) to purchase hardware. In addition, 55% of local educational agencies indicated that they have six or more microcomputers available within their system.

Are computers today making a significant impact on education? This point is still not clear. Henry Becker (1982) argues that even if the number of schools with microcomputers keeps increasing at current estimated rates (30% to 50% per year), the number of computers available in schools compared to the total number of students enrolled or number of classrooms will be small:

> Even with a 50% annual increase in microcomputers (and no change in the number of functioning older pieces of equipment), by 1986 there will be only about three computers per school or one for every eight classrooms. It is important to keep figures like these in mind--even if they are only vague forecasts--when considering how computers can or will impact on classroom education (Becker, 1982, p.10).

Representative Timothy Wirth (D-Col.) proposed allocating 3.2 billion over the next ten years in order to nullify the disparity between the number of microcomputers currently available and the number of microcomputers required in order to provide students with "equitable" access to computers across the nation (Marshall, 1983).

While an extensive effort would be required in order to establish computer based instruction as a major component of instructional curriculum in the United States, the significance of what has occurred in this area over the last several years can not be lightly weighed. Local educational agencies demonstrated the willingness to support acquisition of computer hardware and software over a period of economic decline. When many items in general school budgets have been reduced, school districts have found resources to make major investments in this area. Market Data Retrieval estimated that in 1980 school districts allocated 35 million for microcomputers. They project total sales to increase by 300% in 1985 (Kantrowitz, 1982 A). Other predictions of growth in this industry are interesting:

> Talmis projects that the number of computers sold to school districts will triple by 1985. (Currently, it is estimated that there are about 200,000 computers available in schools).
>
> Demand for educational courseware is expected to be at least 75 million by 1985, rising from sales of 10.7 million in 1981.
>
> The most startling prediction is from Strategic Incorporated of San Jose, CA. They have recently published a report entitled Educational Software for Personal Computers which projects 8.7 billion in educational software sales by 1990, a truly incredible sum (Kantrowitz, 1982 A p.14).

While writers like Henry Becker are correct in questioning the total impact of computer based instruction on the educational system in the country at this time, it should not be inferred that the attention which is now being directed at this development is misplaced. Unlike the 60's and 70's, the availability of computers in schools is becoming commonplace, and the number of computers owned by most districts--while limited in respect to presenting computer based learning for the entire district population--is adequate for the implementation of special programs designed to meet specific goals. George Ayers (1982) sees in the computer an opportunity for schools to meet new challenges generated by declining enrollment figures and by changes in the types of learners served:

> Projects such as PLATO and TICCIT have proved that computers can provide useful and timely instruction for such learners as the disadvantaged, part-time adults, the handicapped, and school drop-outs, groups what will comprise a large segment of the educational population in the future (Paper presented at the National Conference on Computer Based Education: Bloomington, (1980).

Although the roll which computers will fill in the future can be only clarified through time, survey data indicates that a sufficient number of computers are available in local eductional agencies now in order to offer specialized "small group" classes.

Teacher Preparation for CAI:

The Educational Testing Service in 1972 identified several factors which hindered the wide acceptance of computer technology in instructional programming in addition to the prohibited cost of the hardware and software. First, teachers seemed reluctant to use the new technology. "The common rhetoric about computers being better teachers than humans was offensive, especially when compared to the actual quality of most of the instructional programs available"(Coburn,et al, 1982, p.170). Secondly, few teachers had sufficient training in this area. As Peter Coburn (1982, p.171) simply states, "Teachers could not use materials and equipment that they didn't understand." The condition described by the Educational Testing Service in 1972 would have been a valid reflection of computer assisted instruction throughout the 1970's. However, just as the problems identified in the ETS Report related to hardware seem to have been resolved (as least to a significant measure) recent data indicates major changes with attitudinal perceptions of teachers towards the use of computers.

On a survey conducted by Instructor Magazine involving 4,000 teachers, it was noted that more than 85% of educators across the nation indicated that they were interested in using the computer for instructional purposes.

> According to Instructor, "...the demographic profile (of the respondents) closely parallels that of the nation's 1,085,000 elementary educators. The geographic breakdown also parallels those states identified as heavy-user states..." More than half the respondents were classroom teachers, with other groups being media specialists, resource teachers and administrators (Classroom Computer News, 1983, p.16).

In addition, in 1981 some industry spokesmen reported that over 30,000 teachers had computers in their own homes and anticipated a 25% increase in that number annually (Kantrowitz, 1981-B).

While the attitude of teachers towards the use of computers appears to have significantly improved since the arrival of the microcomputer, the effort expended in school districts in order to prepare teachers to use computer in a classroom setting still seems insufficient. The Computer Survey conducted by the Pennsylvania Department of Education attempted to collect data on the effort expended by local educational agencies to provide teacher training in computer literacy proficiency. (Keep-in-mind that Pennsylvania could be considered a heavy-user state, while the national average is about 52% of all schools which have at least one computer, over 80% of the public schools in Pennsylvania state that they have at least one computer for instructional use). According to the information collected through this survey, only 3.86% of teachers in Pennsylvania considered themselves highly trained in the area of computer literacy, 5.65% indicated that they were moderately trained, 11.59%

said they were minimally trained, and over 78% stated they had no training.

> If the figures are accurate to any degree it is evident that inservice training for at least the basic elements of computer literacy represents an urgent need. It must also be acknowledged that the survey may not reflect proficiencies acquired through personal micro ownership and additional formal training in institutions of higher education and elsewhere (Benedetto & Ju, 1983, p. 14).

Therefore, while the disposition of teachers towards the use of computers in schools appears to be positive, data indicates that preparation of teachers to use computers may be neglected. While the Computer Survey in Pennsylvania identified over 400 school districts which owned at least one computer, 200 school systems failed to allocate any inservice time for teachers with computers for the 1983-84 school year: 23% of schools planned to schedule at least sixteen hours of inservice training for the coming school year.

Thus, the lack of adequate teacher preparation for computer assisted instruction is still a concern which must be addressed if schools are to effectively utilize the hardware and software which they are purchasing. The situation today, however, should not be compared to the 70's when ETS noted the lack of teacher training as a major obstacle in advancing the acceptance of computers in schools. Although inservice training at the local school level seems to be minimal, there is a high degree of activity associated with computer awareness on other levels. From September, 1982. to June, 1983, there were 28 scheduled national educational computing conferences. At a regional/state level, over this same period there were no fewer than 160 workshops, computer fairs, and conferences specifically targeted towards educational computing. In Pennsylvania,three universities offer undergraduate degrees in educational computing; two universities offer graduate degrees in this field: Lehigh University and Pennsylvania State University--Ogontz Campus. The most frequently listed courses connected with educational computing, as reflective of a survey of Pennsylvania institutions, are: Introduction to Computers in the Classroom, Basic Programming for Teachers, CAI Courseware Application, Computers in Educational Administration, Teaching Computer Programming, Use of Computers in Specific Disciplines, and High-level Languages as Educational Tools. On a national level, twenty-one institutions offer a master and/or doctorate degree in educational computing (Classroom Computer News, 1983).

The activities related to computer preparation through various conferences and institutions of higher learning is a further indication of the interest which educators are placing in this technology. It is not certain that activities on these levels can replace the need for school districts to plan comprehensive inservicing training for their staff if computers are to become a basic instructional component.

Role of Computers in Educational Settings:

Historically, the computer was viewed as a teaching machine. It has been noted that prior to the advent of the microcomputer the cost of hardware, software, insufficent teacher training, and resistance by teachers to computers has prevented any type of significant impact on instruction (Anastasia,1972).With the major drive by manufacturers to promote the advantages of the microcomputer in 1977, traditional problems associated with the implementation of computer assisted instruction have been considerably nullified. However, the role which the computer should fill in public education is becoming increasingly controversial. As early as 1972, Arthur Luerhrmann advocated the use of computers as a tool in itself. In an article entitled, "Should the Computer Teach the Student, or Vice-Versa," he stressed the importance of a society becoming literate in computer programming. He envisions a society which is significantly reliant on computer technology; those citizens who are unable to use the computer may be delegated to a second class status. Therefore, basic computer literacy should be a major component of public school curriculum. Computers, according to Luehrmann (1972), should not be limited to CAI. While it is not within the scope of this work to deal with the question of the appropriateness of computers for CAI as opposed to their application in promoting literacy (basic programming skills), several points should be reviewed. "Computer equity, rich versus poor, is one of the biggest problems we have," indicated Professor Moursund, "most poor minority kids are drilled on remedial skills--the computer tells them what to do. Rich kids learn programming--they tell the computer what to do" (Computer Teacher, 1983, p.3). Steve Coffin, legislative aide to Rep. Wirth, explained the intention of Congessman Wirth's proposed legislation of allocating 3.2 billion to develop a national program for computer literacy in schools. He noted recent survey data (Johns Hopkins' Report) which indicated that 75-80% of the nation's wealthy schools had computers, while 45-60% of poor districts do not (Educational Funding News, 1983).

> This survey (School Uses of Microcomputers) confirms previous findings that public schools in districts with a high percentage of poor families are much less likely to be computer-owning schools. For example, whereas two-thirds of public schools in the better-off districts have microcomputers, only 41% of the schools in the least wealthy districts have any (CSOS, 1983, p.3).

There appears to be a pattern between the availability of computers and their function in schools and the wealth of the school district. In respect to the application of computers, data supports the idea that poorer schools are more likely to use computers for drill and practice rather than computer literacy. However, a reason for this tendency may be due to the fact that poorer schools qualify for various federal assistance programs which will allow districts to acquire microcomputers to meet certain instructional objectives, such as, remedial programming. Guidelines for these programs are likely to restrict the use of computers acquired through federal support to be used for general purposes, such as, basic computer literacy. Therefore, school districts would be required to limit the instructional possibilities of these computers: this does not necessarily mean that in these schools some activities are not conducted related to computer literacy. Even in districts which only initiate computer centers for remedial programming, it could prove to be difficult to limit the tendency of teachers and students to understand the mechanics of this technology.

The Johns Hopkins' Report, "School Uses of Microcomputers," indicates that there is a growing tendency for schools to use the computer as a "resource" rather than a "tool" for instruction.

> In schools that obtained a microcomputer before July, 1981, nearly two-thirds of the secondary and one-third of the elementary teachers who said that the micro was originally viewed as a "tool" now view it as a "resource". In contrast, only about 10% of those who initially viewed it as a "resource" now consider it to be primarily a "tool" (CSOS, 1983, p.6).

An additional criticism of CAI is that it adheres to a questionable behaviorist learning model. B. F. Skinner, Harvard University, applied Thorndike's law of effect in developing programmed learning materials. In essense, it is predicted that as learners respond to questions and receive immediate positive feedback (good programmed learning materials are designed so that learners will usually respond with correct answers) learning will be facilitated and enjoyable.

> Most CAI authoring systems are based on the S-R (stimulus/response) model. They seem to assume that the law of effect is in full force in CAI. The options built into many CAI authoring systems make it easier to use S-R theory than not to. In fact, in a few systems the author is forced to us S-R theory (Burke, 1982, p.23).

Despite recent criticism of computer assisted instruction, it "represents probably the largest single category of computer use in the field of education" (Coburn, et al, 1982, p.21). Local educational agencies in Pennsylvania indicated the curriculum areas in which computers were used. Both computer programming and computer literacy were rated high: 69% of responding agencies stated that computers were used to teach computer programming and 60% indicated that they provided computer literacy courses. However, 83.6% of school districts, intermediate units, and AVTS's used computers as supplemental activity in presenting mathematics. Other applications of computers in curriculum included: reading, 26%; science, 44%; business education, 58.5%; language arts, 15%; guidance, 16%; social studies, 12.9%; and library science, 9%. Other minor uses (less than 10% of the sample size) were home economics, industrial arts, foreign languages, art, music, health, and physical education. Also, it is interesting to note, the use of computers specifically for presenting remedial/compensatory programming was practiced in 82.9% of the educational agencies in Pennsylvania--at least to a moderate degree (Benedetto & Ju, 1983). Not only are computers significantly used to present basic skills (math, reading, and language arts) but it appears that schools are considering the use of computers a variety of curriculum areas.

Defining Computer Assisted Instruction:

> CAI is the direct use of the computer for the facilitation and certification of learning--that is, using the computer to make learning easier and more likely to occur (Facilitation), as well as using the computer to create a record proving that learning has occurred (Certification) (Burke, 1982, p.16).

This definition is fairly broad. Some earlier writers referred to CAI as solely tutorial or interactive instruction: drill and practice and instructional simulations were considered a separate category. Today, CAI is considered to encompass traditional instructional strategies, such as, drill and practice, tutorials, and demonstrations; and less traditional approaches, such as, simulations or instructional gaming.

Drill and practice exercises are the most simple to design; a microcomputer with limited memory capacity can present good drill and practice programs simply because the design of these types of programs do not necessarily require expanded memory in the computer. In essense, drill and practice exercises assumes the learner has been exposed to the basic concepts of the content area which will be presented--the purpose is reinforcement. The vast majority of programs available to educational agencies are of this type. While it is commonly assumed that the largest number of programs on the market are written for mathematics, survey data indicates that the most extensive collection of courseware is related to language arts, grades 3-6 (Kantrowitz,1981 A).

Tutorials are designed to provide the learner with new information or concepts or clarify certain concepts. Interaction between the learner and computer is the key element in distinguishing poor programs from excellent courseware. "This type of program bears very careful evaluation. There are many programs on the market that claim to be tutorial in nature, but, in fact, don't quite measure up" (NSBA, 1983, p.43). By design and content considerations, these are the most difficult programs to develop. Yet, tutorials are capable of providing individual assistance and attention to learners based on their particular needs.

Demonstrations are only now becoming more common on the market. It is predicted that demonstrations presented on the computer will eventually render overhead projectors obsolete (Coburn, 1982). The capacity of small computers to provide color, sound, graphics, and animations can enhance demonstrations presented through the use of computers, such as, the functioning of the human body, understanding graphs and measurement systems, observing certain physical phenomenon.

"Simulations provide learners with opportunities to experience real life events, objects or situations by means of graphic representation or textual questioning" (NSBA, 1983, p.43). The learner can experience how variables may affect intended or predicted outcomes; thus, the learner becomes involved in decision-making based on cause and effect relations. Often, it may be difficult to clearly distinguish between demonstrations and simulations. Basically, simulations are involved in problem-solving exercises. Many educators will argue that the unique features of the computer are most appropriately tapped in the presentation of simulations rather than drill and practice or tutorial exercises.

Educational Gaming serves two functions. First, they are considered entertaining for learners; thus, they can motivate students. Second, they can be designed to provide reinforcement in some academic area. The over-riding criteria for evaluating games should be their relationship to a defined instructional objective.

Theoretical and Research Support for CAI:

> Despite this excitement about using the new microcomputers in schools--an excitement that is reinforced by commercial efforts to sell computers and computer program products to this potentially large and relatively centralized market--many people doubt that a single or multiple purchases of instructional equipment costing hundreds or thousands of dollars per item can be justified in most schools unless unprecedented academic accomplishments can be expected to follow from their use (Becker, 1982, p.1).

Attempting to evaluate computer assisted instruction in respect to "unprecedented academic accomplishments" is simply not reasonable since their is less than full consensus in the educational community as to what constitutes "unprecedented" academic achievement. Computer technology can only be assessed within its specific setting. Does it meet the needs of the organization and its clients in a cost-effective manner under the particular educational climate prevalent in that system? The experiences shared by other educational agencies in regard to the use of computer aided instruction can provide general guides, clues to how similar techniques may work in other environments.

Advocates of CAI draw support from three areas: (1) there is theoretical support for the use of computers as an aid to instruction; (2) a significant number of research projects (covering a broad range of academic subjects and directed at a varied group of learners) have indicated positive outcomes; and, (3) in practical experiences, teachers and students from numerous sites have responded enthusiastically to computer assisted instruction.

The science of education is far from exact, in fact, some social scientists and educators feel that the ability to effectively teach is closer to an "art" than "science." Studies designed to isolate elements of effective teaching or instructional programming, however, center on similar points of agreement: immediate and frequent freeback to learners, individual attention (personal instructional plans), variability of classroom activities, motivation of learners (generating interest/enthusiasm), individual pacing of instruction to match the capacity of the learner, and task-oriented or achievement-oriented instruction (e.g., Rosenshine & Furst, 1971; Gordon, 1971; Joyce & Weil, 1972).

Computer technology allows adaptive instructional programming. Not only is it possible to individualize instruction to a point which would be difficult to manage in a traditional classroom (each learner with his/her own program), but instruction can be delivered at a pace consistent with the needs of the learner. The computer can provide immediate and continual feedback, and feedback is essential in the learning process. Many aspects of the computer seem highly appropriate with the needs of disadvantaged learners. The disadvantaged learner needs individual attention, and the computer is consistantly responding to the inputs of the learner; however, the learner is not controlled by the learning process, rather he/she is controlling the process by their responses on the computer. This can afford the learner a degree of control over their environment. Educationally disadvantaged learners need to feel free to progress at their own rate, and the computer allows the learner to set the pace of instruction. Many educationally disadvantaged learners have been turned-off by the traditional educational system which they highly associate with their own personal failures and frustrations in academics; the computer provides an environment which is free from some of those negative impressions. "Another great strength of the computer is its ability to interact with the student. Interactions with the printed page is limited to the student's imagination--the best vehicle perhaps for the good student, but not enough for the slower students" (Kantrowitz, 1982 B p.1).

Advocates of CAI can rely on a significant body of research which supports the effectiveness of computers in instructional programming. Experimental projects have been conducted in a wide-range of settings, addressing various instructional objectives and groups of learners. In general, correlations have been demonstrated which indicates a relationship between increased learner performance and computer assisted instruction. Whether CAI was used in public schools, elementary or secondary, colleges and universities, military installations, or correctional institutions, outcomes have typically been cited as positive.

Some of the earliest efforts to measure the effectiveness of CAI were conducted in the military. Both the army and navy implemented computer aided instruction for training basic electronics. In particular, the Naval Personnel and Training Research Laboratory, San Diego, carefully evaluated the advantages of CAI over traditional instructional strategies. Quasi-experimental designs in which comparisons of groups using computers were made against groups who did not use computers suggested that CAI could be effective in addressing certain instructional goals (e.g., Longo, 1969; Ford & Slough, 1970; Hurlock, 1970).

Projects directed at Stanford, starting in 1963, provided initial support for the contention that computers could be effective in assisting disadvantaged students master basic skills, particularly in mathematics. Test projects evaluated the work of elementary students in Mississippi, Appalachia, inner-city schools, rural areas, and even Native Americans in New Mexico; results were consistently reported as positive (Suppes & Morningstar, 1969; Suppes & Morningstar, 1972; Suppes, Fletcher & Zanotti, 1975).

In an experimental project conducted at Waterford Township Schools, Michigan, test scores and the time required to master certain tests were improved when instruction was provided via the computer (Pagen, 1970; Scrivens, 1970). Similar conclusions were reached in Montgomery County, Maryland, however, rather than using the computer for providing instruction in elementary mathematics, the objective was to assist high school students master algebra (Robinson & Lautenschlager, 1971).

A major study was reported in 1972 by Vinsonhaler and Bass; they examined CAI projects at ten different sites (involving over 30 groups of elementary students with and without access to computers) and concluded that CAI was more effective than traditional instructional techniques based on outcomes of standardized test scores.

Jamieson, and his associates, (1974) noticed that drill and practice exercises provided by CAI had a greater impact on raising the test score results of learners functioning below grade-level than students working at their normal academic level. This finding supports Suppes idea that CAI would be more appropriate for addressing the needs of disadvantaged learners.

Hall and Mitzel (1974) observed that CAI was effective with high school students. A project operated in the Chicago school system found CAI drill and practice exercises to be particular effective at the middle-grade levels for improving reading achievement (Litman, 1977). Hartley (1977) found a standard deviation of .5 in elementary test scores between groups which had CAI in an individually paced mathematics program and those who received traditional instruction.

At the college level, Roll and Pasen (1977) noted that enrolled in introductory psychology courses required one-third less time to master the course criteria when instruction was provided through CAI rather than through the lecture, traditional, format. Kulik, Kulik, and Cohen (1980) reported statistical data collected from nearly 60 independent studies involving the application of CAI at the college level. They indicated that test scores were improved about .25 standard deviations--a modest but significant difference. Also, attitudes towards instruction and instructional content were slightly improved.

The U.S. Navy assessed CAI specifically for presenting basic skill instruction to recruits reading below the 6th grade level. Wisher (1980) found the computer to be highly effective in improving reading ability when learners were introduced to phonics via a tape-drive voice synthesized connected to the computer. Learners who had CAI showed increased improvement over recruits who did not receive instruction delivered through this means. In terms of cost, it was reported that CAI was more cost-effective than traditional instruction (Stolte & Smith, 1980).

An evaluation of CAI by the Educational Testing Service was conducted in the Los Angeles School District. The results were somewhat mixed. Consistent with previous research projects, CAI had a positive impact on mathematics; however, significant gains were related to drill and practice exercises designed to improve basic computations skills. In respect to improving conceptual skills, it was not always clear that CAI was any more effective than traditional instruction. Also, reading and language arts test scores did not significantly improve when instruction was supplemented by CAI (Ragosta, et al, 1981).

It is important to note that in these research projects, it is more proper to realize that what was actually being evaluated was not the computer, but rather the courseware which was presented through the equipment. The positive outcomes associated with drill and practice exercises in mathematics is likely due to the differences in designing curriculum for the different instructional disciplines.

> Mehmed (1980) points out that C.A.I. more closely simulates practice of math than practice of reading or language use. Equally important perhaps, is that language and reading are used throughout the school day; thus C.A.I. language exposure is more limited relative to total exposure than is C.A.I. math experience (cited in Becker, 1982, p.20).

Some educators base their rationale for investing in CAI on neither the theoretical support nor test data; rather, they view the computer as a prime motivator. Anecdotal accounts are frequently inserted in popular journals which dramatically detail the impact of computers as they become a part of the school environment. For example, there is the story of the school in Minneapolis which was hit by a snow storm, it took only seconds for the students to clear the building after classes were cancelled for the afternoon--that is, all except the kids in the computer room who refused to go home (Marbach, 1982). Until recently, short accounts provided the major source of data to base support for CAI as a motivator. However, the Illinois Board of Education examined enrollment in mathematics classes from 1977 to 1982, based on their survey it was reported that participation in classes increased by 4 percent over this period--"the same period in which microcomputers were being introduced on a large scale for everyday business and research uses" (Education Week, 1983, p.6).

Concluding Remarks:

A major impediment to CAI, cost of the hardware and courseware, has been dramatically reduced with the commercial marketing of the microcomputer. The attitude of teachers towards use of computers for instruction appears to be favorable for implementation in education. Although there is increased activity in respect to teacher preparation for CAI at the university level and numerous computer conferences arranged for educators, it appears that teacher in-servicing programs at the local school district level is not adequate in terms providing instructional personnel with the type of experiences that educators require. This opinion is evident in the response of teachers noted by Benedetto and Ju (1983) in the Pennsylvania Computer Survey.

Data collected from various sources show that the availability of microcomputers in schools are becoming increasingly common--particularly in industrial states. In Pennsylvania, for example, it was observed that over 50% of local educational agencies had six or more computers available within their system. Although Henry Becker (1982) may be on target in questioning the overall impact of microcomputers in education (based on the ratio of computers to total student enrollment), educational agencies with five or more microcomputers do have sufficient hardware in terms of presenting CAI for small groups of students.

Adult educators may not need to consider if funds available for instruction should be allocated towards the acquisition of computer hardware and software; rather, it is more significant for adult educators to identify the resources available in local educational agencies in terms of computer equipment and seek means for coordinating the use of these facilities.

Based on the evidence collected over the last two decades, theoretical and research finds would support the notion that implementing CAI in Adult Basic Education would be advantageous.

Project Setting:

Schuylkill County is situated in the heart of the anthracite coal belt of Eastern Pennsylvania. The decline of the coal industry also spelled economic decline for the economic health of the region. Over the last several decades, Schuylkill County has reported higher unemployment and lower per capita income than national or state-wide norms.

The Shenandoah Valley School serves a small community in Northern Schuylkill County; less than 1,000 students are enrolled in both the elementary and secondary schools. Since 1980 Shenandoah Valley has conducted ABE and GED programs. Through this period, CAI became a basic component in remedial programs for both elemenatry and secondary learners.

In 1980 some effort was made to use microcomputers for remedial adult learners. This effort was expanded in 1981. However, a Special Project, 310 Grant, by the Division of Adult Education, Pennsylvania Department of Education, provided the funds for an extensive survey of computer software in order to determine the appropriateness and availability of programs for adult learners. In 1982 a second Special Project, 310 Grant, was approved for the Shenandoah Valley School District and Intermediate Unit 29 in order to assess the effectiveness of CAI in Adult Basic Education.

The hardware and software available in the Shenandoah Valley School District is not exceptional, in fact, in a comparison with school districts which have computer centers for remedial programming, the facilities are somewhat typical of survey profiles.

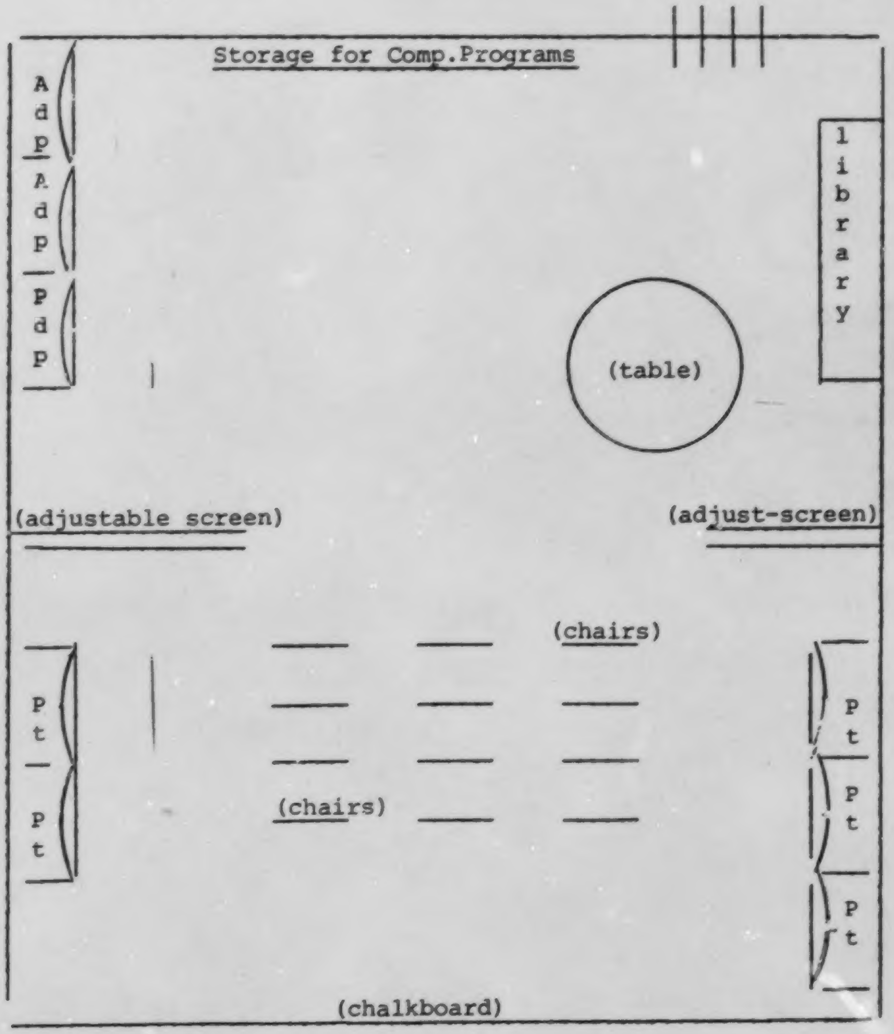
Eight microcomputers were available in the computer center: 2 Apple (48K) computers and 6 Commodore PET (32K) models. Three models (2 Apple & 1 PET) were initially disk-drive operated; however, during the last 100 hours of the

ABE scheduled classes, all the PET computers were disk-driven. Two printers were also available; one printer was compatible with the [illegible] computers while the other printer was compatible with the PET computers.

In addition to computer hardware, traditional instructional equipment and materials were also available within the resource center.

CAI Resource Center--Configuration

A=Apple Computer; P=PET Computer; d=disk drive; t=tape drive; p=printer


Storage for Comp.Programs
A d p
A d p
P d p
library
(table)
(adjustable screen)
(adjust-screen)
(chairs)
(chairs)
P t
P t
P t
P t
P t
(chalkboard)

The CAI Resource Center was designed to permit flexibility in arranging facilities to accommodate various instructional strategies. With minor arrangements, traditional lecture-type instruction can be conducted. The adjustable screens allows the room to be subdivided. Space is available to permit two students to be stationed at each computer video screen. Each chair has a support for writing.

Instructional staff for the two ABE classes invloved four teachers. Each teacher was responsible for 100 instructional hours. In respect to computer awareness, at the initiation of this project only one teacher had extensive experience in using microcomputers in remedial programming. The other three teachers were both interested and eager to use the computers as an aid to instruction, but their exposure to microcomputers prior to the start of this project consisted of one half-day inservice program offered in the local school district on the general applications of microcomputers in education. Training for CAI in Adult Basic Education consisted of twelve hours of preparation in the basic operation and maintenance of equipment and software before ABE classes were started. An additional twelve hours of inservice training were scheduled over the 200 hours of ABE programming.

Project leaders, both at the Shenandoah Valley School District and Intermediate Unit, No.29, had extensive experiences related to CAI and in curriculum development.

Listings of courseware for instruction will be outlined. However, it should be noted many of the programs used were selected based on their positive evaluation in journals and popularity (determined by sales) in school districts.

Thirty-one adults were enrolled in ABE classes which were going to receive CAI as a basic component of their instructional program. The average age for adults was 28.5 years. Northern Schuylkill County has a high senior citizen population (on the national level approximately 12% of the population are senior citizens, in Schuylkill County 14.5% of the total population are senior citizens). Female students composed nearly 75% of class enrollment. Thirteen students were originally assessed at functioning below the 5th grade academic level in either math or reading. Students were tested on the Metropolitan Basic Battery--Achievement Test. Over 60% of adult students indicated that their prime motive for enrolling in ABE classes was to earn a high school diploma; 32% of adults indicated that they were interested in improving their basic skills and/or qualifying for a better job.

Role of Observer

An observer was selected to record and note the effects of CAI on both the students and instructors. Over 100 hours were spent on observing classroom activities. The observer did not interfer in classroom instruction, but did work with the instructional staff in suggesting instructional strategies and using courseware. It would be difficult to maintain that the observer did not influence the outcomes of the project. While the observer did not require teachers to follow any specific procedures, the presences and assistance of the observer may have been a significant factor in leading teachers to initiate and experiment with different techniques invloving CAI.

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Unanticipated Problems--Computer Hardware

Although Schuylkill County is a depressed economic region, microcomputers are fairly available at local educational agencies. Both the Shenandoah Valley School District and Intermediate Unit, No.29, provide ABE/GED classes at site locations in which a sufficient number of microcomputers could be available for CAI during evening hours. As indicative of national and state-wide survey data, finding computers in school facilities is becoming commonplace. The obvious fact that both the Shenandoah Valley School District and Intermediate Unit 29 jointly applied for a special project grant to test CAI in adult education classes ensured maximum support from upper management in these institutions. Therefore, considering we had full top administrative support and microcomputers available at sites which support evening ABE/GED classes, we did not anticipate having any difficulties in selecting possible locations to conduct this project. This was not the case. Out of four classes of ABE students, we intended to provide two classes with CAI, but it was our expectation that the selection of which ABE classes would have CAI would be based on certain demographic factors.

Diffused Computer System:

At one site two ABE classes were conducted. While there were over sixteen microcomputers (Apple & TRS-80's) housed in that location, they were diffused through the entire building rather than centralized in one or two centers. In effect, approximately 10 teachers had access to one or two computers in their classroom during the regular school day. In order for these computers to be available for adult learners either the computers (or a sufficient number of computers) would have to be centralized or adult students would have to be dispersed through the building to the classrooms which had microcomputers. The only reasonable option was to attempt to centralize some of the computers.

In a building where computers are centrally located, in order to coordinate the availability of computer hardware for adult evening classes, agreement would likely involve interaction with one or two school officials: the building principal and/or curriculum (media) specialist. When computers are shared between the teaching staff, coordinating expanded use of computer equipment becomes increasingly difficult to arrange. Simply, each involved teacher would need to be convinced of the advantage of moving their computer from their classroom in order to maintain one centrally located computer lab which could be shared by the teachers throughout the school day and used by ABE instructors in the evening. There are advantages and disadvantages to diffused and centralized computer systems. Since computers are an expensive resource, educational agencies should consider the deployment of computer hardware which maximizes student use. It is not clear how one or two computers can be effectively used in a teachers classroom while other instructional activities are ongoing. Generally, centralizing computers provide an opportunity for entire classrooms, or small class groups, to receive simultaneous assistance or instruction. There are still many local factors which hamper the goal of integrating computers into the basic structure of classroom activities. These factors promote the idea of diffused placement.

> The choice of how microcomputers are distributed in the school may not be independent of the decisions about their use. Although this proposition needs further empirical elaboration, a strong relation appears to exist between placement and predominant use (Becker, 1982, p. 59).

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Henry Becker (1982, p. 59) suggested that when computers are under the direct control of individual teachers "there is likely to be little talk of 'improving learning outcomes.'"

> Instead the focus may be on curricular enhancement...In contrast, centralization of computer facilities is often accomplished in schools emphasizing C.A.I. drills, computer-management of individualized drill, and record-keeping (Becker, 1982, p.59).

This observation was consistent with what we found. In addition, we found the attitude of the building principal to be related to the manner in which computers were placed within the building. In a comparison of two AVTS centers, when the building principal felt positively towards the computer as an instructional tool, the computers were centralized. When the building principal seemed disinterested in computers, the hardware was decentralized under the control of various interested teachers. We suspect that the problem we encountered in the building with the diffused computer system was not merely related to the physical arrangement of the computer hardware, but to the role in which computers were envisioned in instruction. Using computers for remedial programming was not a priority in the building which had computers decentralized.

In the buildings where computers were centralized and used primarily for CAI, cooperation for extending the availability of computers for adult evening classes was readily granted by building level managers.

Networking Computer System:

At one location in Schuylkill County, an extensive microcomputer networking system was available for adult learners. Over twenty-five microcomputers were located at this center with each computer connected to a central control panel. This made it possible for an instructor to monitor/manage each computer in the system. In addition, space was available in this room for traditional instruction. This center seemed ideal for initiating CAI with adult learners but there were unexpected problems which developed.

The type of courseware which we intended to use for instruction was generally copy protected--this made it impossible to download from the control panel into separate computers in the networking system. In effect, the technological advantages of the networking system could not be utilized unless we wished to use courseware which was not copy protected. We elected not to accept this limitation based on the quality courseware which was operative on this system. Before commitment is made by adult administrators/instructors to use a computer networking system as an aid to remedial instruction, a careful assessment must be made in order to determine the quality of the courseware available. Courseware producers are charging additional costs to schools in order to allow their programs operate on a networking system and more producers are designing their programs to be copy protected. One of the reported advantages of using microcomputers for instruction is the capability of the equipment to offer individualized assisted instruction. In the situation we encountered, to use the networking system required that we accept a limitation on the number of computer programs we could use with our adult learners--thus restricting our ability to more fully individualize instruction. This will not necessarily be the case in other localities. Administrators/educators need to evaluate the type of courseware which are compatible on a network.

Unanticipated Problems--Staff Preparation

Beginning this project we did not expect to have problems related to staff preparation, although this is a general concern which has been identified in teacher surveys. Our experience has shown that 1.5 days of in-service training was sufficient for teachers to gain basic skills required for operating the computers: loading & unloading programs, basic maintenance associated with daily operation, etc. In addition, most of the staff which worked in ABE programming was previously exposed to microcomputers. Our problem was not associated with staff familiarity with the hardware, but courseware. In planning this project, the program director and program curriculum advisor selected computer programs to address specific instructional areas. Each instructor was provided with an evaluation sheet of every program which could possibly be used for adult learners. The evaluation sheet, consisting of two pages, indicated the type of information which, we believed, would aid teachers in assigning programs to students based on their particular needs, such as: subject area, grade level, interest level, time required to complete the program, a description of content, a description of the technical features of the courseware, the degree of versatility the program allows the teacher, (determining the number and type of problems) the information which the program will provide to the teacher about the learner, and comments from other educators about the overall effectiveness of the program. (*Since we previously used computers with adult learners, we had a preformed idea of what programs worked adequately with most adult learners).

The problem we encountered was related to the scope of our project. Instructors had over one hundred programs which could be assigned to our adult students. Although each program had an evaluation sheet, teachers felt extremely uncomfortable assigning programs which were not personally previewed. The time required to familiarize staff with the courseware which was available in our program would likely exceed 5 days. In planning inservice training, we concentrated on assisting teachers to understand how to manage the hardware. We found that we did not allocate sufficient time in order for them to be adequately exposed to the courseware. While an entire series of programs were available at the start of the project, teachers assigned programs based primarily on their familiarity on the contents. In the beginning, only a fraction of the programs available were assigned and assigning programs was more conditional on what the teacher was exposed to than what was appropriate for the learner. This situation improved as the project progressed; therefore, the quality of CAI also improved as teachers became increasingly aware of the various programs in the computer center.

Unanticipated Positive Outcomes

As the project progressed, adults became increasingly active in selecting courseware for themselves and assisting other students in both the selection and operation of certain programs.

First, this freed the instructor from some time-consuming activities, such as, loading and unloading computers. Most significantly, however, adult students became active in their own educational experience. This was not observed to be an intentional goal of the instructors. Although those responsible for initiating the project should have realized the possibility of using the computers in a manner which permitted adults to exercise independent judgment in their own educational program, it was a matter which was given minimal consideration prior to the operation of the project.

Adult learners became familiar with the basic operation of the hardware through direct observation of the teachers. Gradually, adult learners assumed a right to select certain programs which other students previously used or to review programs to which they were previously assigned. Some adults used the evaluation sheets provided to teachers to select programs which were not previously used in class (generally, the more active students were in the ABE (5-8) grade level achievement range). Interestingly, their selection of courseware was reasonable. The only difficulty encountered with adult selection of courseware was that a small number of adults would select programs which were beyond their capacity to complete (*at least in terms of what information was contained on the programs themselves to assist in problem solving). Adults who were making adequate progress, for example, in solving basic mathematics problems desired to run computer programs for algebra without having sufficient exposure to information for mastering that skill. A small but consistent number of adult students (4 out of 31) regularly took advantage of arrangements to have the CAI Resource Center open a half-hour prior to the start of classes for additional instructional activities.

Summary--Unanticipated Consequences:

(1) Based on our experience, coordination of hardware available in educational agencies will be facilitated when computers are used in a centralized location and where CAI for remedial instruction is employed.

(2) Staff preparation would be scheduled specifically for allowing teachers to adequately preview courseware (this will require significantly more time than familiarizing teachers with the basic operation of the computer hardware). CAI programs should be planned to be phased in over a certain period of time, thus, allowing a gradual opportunity for staff to become adequately exposed to the courseware available for individual perscription.

(3) Activities should be designed to allow adults to assume certain control over the use of computers and selection of courseware for instruction.

Courseware Selection for Adult Education Classes:

The Shenandoah Valley School District received a special project grant (1982/83) expressly to evaluate current commercially produced educational programs available on microcomputers which would be appropriate for adult learners. Our focus through this survey was generally on courseware programs developed by independent producers. Major producers of educational materials (SRA, Borg-Warner, Random House, Holt, and Milliken) were reluctant to enter into development of courseware for microcomputers until the early 80's. As microcomputers became popular in schools during the late 70's there was a natural void in respect to software availability which became rapidly filled by independent producers. Today, there are approximately 200 independent producers; naturally, the quality of the courseware varies significantly between producers. The project which Shenandoah Valley initiated to evaluate courseware centered chiefly on the programs developed by the independent producers. There were several reasons why the large corporate-type producers were basically excluded from this survey. Companies like SRA and Borg-Warner directed their efforts at developing comprehensive courseware series including student managed instruction; this required expanded memory in the microcomputer. Therefore, their early programs were designed to run exclusively on the Apple computer. In Pennsylvania today, the Apple computer is extensively used in public schools, in fact, it is second in sales only to TRS 80. However, it represents less than 31% of all the microcomputers available in the Commonwealth (Benedetto & Ju, 1983). In terms of cost, the fact that quality programs from independent producers can be acquired for as low as $25 while many of the educational series designed by the corporate producers will cost $500 or more, has influenced many school districts to select independent producers as a source of courseware for CAI. The type of programs we evaluated could be classified as the most popular in education, the most likely to be found in school districts. We can not say that the quality of these programs is necessarily superior than the courseware developed by the major corporate-type producers.

It was from this source that an effort was made to structure a CAI curriculum in math, reading, and language arts for adult learners. The survey of educational courseware (1982/83) for adult learners sought to assess computer programs which were frequently cited by educators, distributors, professional journals, computer magazines, and computer newsletters as exemplary. Restraints of time and money limited the comprehensiveness of the survey, in addition, new programs are being released so rapidly on the market; it would require a herculean effort to keep fully abreast of what is available.

Our criteria for determining appropriateness of courseware for adult learners was based on our perception of the capacity of the program to provide clear directions to the learner; we sought programs which had at least some tutorial characteristics (the potential to instruct). Gaming and simulations were not given priority in the survey. Excessive graphics and reinforcement (both positive and negative) were considered extraneous for adult learners.

Based on our survey, we concluded: (1) few programs were designed specifically for adult remedial education; (2) many programs designed for remedial instruction at the elementary/secondary level, however, could be used in adult classes; (3) the most appropriate and available courseware for adult learners seems to be at the (5-8) grade level for both math and language arts; (4) at the (1-4) grade level many of the programs available used a gaming format or graphic displays which were directed at motivating young children; and, (5) at the (9-12) grade level, we found little attention in the development of courseware for remedial application (Paul, 1982).

In general, we believed, that with careful screening "it should be possible to select a series of programs which, at the very least, would be adequate in utilizing computer assisted instruction for adult learners" (Paul, 1982, p.51).

The following programs were selected for use in our computer center based on the survey of software for adult learners:

Mathematics--Instructional Level (1-4)

Whole Number Arithmetic Educational Micro Systems cost $110	Can be used for assigning practice exercises or testing. Allows flexibility in determining type, number, and difficulty of problems. Covers basic mathematical operations.
Addition,Subtraction, Multiplication Microcomputer Workshops cost $75	Provides step-by-step assistance in problem solving; allows flexibility in determining type, number, and difficulty of problems.
Long Division: 1,2,3 Digit Microcomputer Workshops cost $25	"As above," instructor or learner can program problems with the number of desired digits--up to three.
Addition with Carry Microcomputer Workshops cost $25	"As above," allows problems to be constructed up to nine rows & nine columns.
Multiplication: 1,2,3 Digit Microcomputer Workshops cost $25	"As above"
Introduction to Mathematics Educational Activities cost $40	Four basic skills are covered, six levels of difficulty can be selected. If the learner solves 85% of problems the program will advance to the next level. Problems will be posed in a verbal form if the learner fails to solve the problem 2 times.

Mathematics--Instructional Level (1-4) continued

Missing Math Facts Educational Activities cost $40	Provides an answer, students must identify the missing components required to arrive at that answer. Four difficult levels are possible.
Compu-Math: Arithmetic Skills Edu-Ware cost $40	Four basic operations are covered. Flexibility in determing appropriateness of problems & Pre-testing to determine students current level.

Mathematics--Instructional Level (5-8)

Intermediate Math Skills Orange Cherry Media cost $70	Covers fractions: addition, subtraction, multiplication, & division; decimals, and percents. Utilizes graphics to explain concepts.
Introduction to Decimals Educational Activities cost $40	Flexibility in determing difficulty level, similar format to Intro. to Mathematics by Educational Activities.
Introduction to Percentage Educational Activities cost $45	"As above"
Read & Solve Math Problems Educational Activities cost $85	Demonstrates important elements in verbal problems and how to convert these problems to numeric form, key words are stressed in solving problems.
Survival Math Sunburst cost $50	Utilizes four simulations to convey basic facts, such as; shopping, operating a small business, etc. Covers measurements.
Money Management Assessment Interpretive Education cost $175	Topic includes basic vocabulary associated with money management, skills related to banking, i.e., balancing a check book, working with a calendar.
Compu-Math: Decimals & Fractions Edu-Ware cost $50 each	Defines and explains various operations including proper labeling of terms.

Mathematics--Instructional Level (5-8) continued

Math and Your Personal Finances Media Materials, Inc. cost $100	Mathematical skills need to manage personal finances, e.g., working with household budgets, buying on credit, cutting expenses on necessities.
Banking & Consumer Transactions Media Materials, Inc. cost $100	Activities involve paying bills, constructing home budgets, maintaining checking account and saving accounts.
Algebra Drill & Practice Conduit cost $125	Basic introductory information for algebra--designed as drill & practice rather than tutorial.
Data Plot Muse Co. cost $40	Demonstrates various graphic displays used to represent numeric data.
Solving Equations Educational Activities cost $45	Provides exercise in solving equations. Students will receive a step-by-step demonstration if they are unable to correctly solve the problem

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Reading/Language Arts--Instructional Level (1-4)

Alphabetta Merry Bee cost $30	Includes beginning dictionary skills in addition to sequencing/ordering skills.
Alphabetical Order Orange Cherry Media cost $35	Activities related to sequencing and proper-ordering, flexibility in selecting appropriate difficulty levels.
Spelling Orange Cherry Media cost $35	Includes two activities: (1) a word will appear (tachistoscope type system) and the learner must correctly respell the word from memory and (2) several words are displayed and the learner is asked to identify the correctly spelled word.
Vowels Hartley cost $100	Involves basic drill & practice exercise in vowels for beginning readers; the program can branch to the level of the learner.

Reading/Language Arts--Instructional Level (1-4) continued

Consonants Hartley cost $80	Drill & practice exercises for beginning readers.
Word Families Hartley cost $30	"As above," programs designed by Hartley usually omit the type of graphic displays which are targeted towards elementary students.
Vocabulary-Dolch Hartley cost $40	Words appearing on the Dolch list are used for basic drill & practice.
Who-What-When-Where-Why Hartley cost $40	Students are exposed to basic word concepts.
Comprehension Power (Levels A-C) IC/T --Milliken cost $450	High interest/low skill materials for beginning readers. Activities involve exposing the learner to key words, main idea, spelling, and presentation of a passage (line-by-line) in which the instructor or learner can control the rate of speed of the sentences.
Cloze Technique Orange Cherry Media cost $35	Learners are presented with a brief passage and are required to select from a multiple listing the correct missing word.
Compu-Read Edu-Ware cost $30	Deals with character recognition, high-speed recognition, synonyms, antonyms, and sentence comprehension. The instructor has some control over the difficulty level.
Basic Reading Skills & Practices Levels A,B,C,& D Brain Bank cost $240	Each program contains five stories followed by a series of questions (5) related to basic reading skills: main idea, recalling detail, etc. Graphics and animations are used.
Our Weird & Wacky World Educational Activities cost $80	Contains 8 humorous stories. It uses the cloze technique and the ability to recall detail. If students miss a question, the program will automatically loop back to the specific passage in the story which is needed to complete the correct answer.

Reading/Language Arts--Instructional Level (1-4) continued

Vocabulary Builders Orange Cherry Media cost $70	Consists of four programs: Synonyms & Antonyms, Recognizing Homonyms, Identifying Meaning through Context Clues, and Vocabulary Building Skills. Uses several formats for presenting information including games.
Vocabulary Builder I Program Design Inc. cost $20	Provides early primary instruction on synonyms and antonyms--drill & practice.
Verbs I Teacher's Pet cost $15	Provides drill on the use of "is," "are," "was" and "were."

Reading/Language Arts--Instructional Level (5-8)

Spelling Builder Program Design Inc. cost $30	Contains 8 programs which introduces and reinforces basic spelling rules and gimmicks for mastering basic words. Over 250 words are used.
Opposites Hartley cost $30	Provides drill & practice for students in identifying words with similar and dissimilar meanings.
Verb Usage Hartley cost $50	Practice is offered to students in discriminating between present, past, and past participle form of frequently used verbs. The program is designed to allow teachers to modify or delete any lesson.
Verbs Hartley cost $35	Recognition and identification of verbs, tense, subject-predicate correspondence, contractions, and correct usage is presented in drill & practice exercises. The instructor can modify word usage in the programs to better match the learner's reading level.
Nouns/Pronouns Hartley cost $33	Recognition of common and proper nouns, possessives, noun plurals, identification of pronouns and antecedents. The instructor can select the difficulty level to match the learner's academic level.

Roots/Affixes Hartley cost $50	Contains 21 lessons which stress the meaning of prefixes and suffixes and how they contribute to word meaning. The instructor can select various reading levels of difficulty.
Capitalization Hartley cost $50	Introduces the major rules, provides exercises and testing. As with most of Hartley's programs, the instructor can easily modify the programs to add or delete questions.
Comprehensive Power (Levels D-F) IC/T--Milliken cost $450	Activities involve identification of main idea, spelling, and reading at a specific rate of speed determined by the instructor or learner.
How to Read in the Content Areas Educational Activities cost $180	This series consist of four topic areas: science, social studies, literature, and mathematics. Under each topic area, the learner can select from several stories. Questions are posed to the learner in order to assess the ability to recall facts, understand vocabulary, identify main idea, and make proper inferences. An incorrect response will cause the program to transfer the learner to the specific passage which needs to be reread.
Active Reader--World of Nature Orange Cherry Media cost $70	Offers high interest stories for learners with limited reading skills, such as: unusal animals, earthquakes, etc.
English Basics Educational Activities cost $210	Simple drill exercises on nouns, verbs, synonyms & antonyms, adverbs, pronouns, adjectives, homonyms.
Punctuation No.1 & No.2 Educational Activities cost $50 (each)	Punctuation No.1 covers the period, exclamation point, and question mark. Punctuation No.2 covers the comma. In both programs errors are corrected by referring the student to a set of rules which relates to the problem he/she made.
Adventures Around the World Orange Cherry Media cost $70	Four stories, high interest/low achievement levels, are provided. Students are asked certain questions related to comprehension throughout the text.

Reading/Language Arts--Instructional Level (5-8) continued

Reading Comprehension: What's Different Program Design Inc. cost $25	The learner is presented with a series of four words and must identify the word which does not belong. Ten study units are presented covering basic words used in grades 3-6.
Capitals Teacher's Pet cost $10	A sentence is displayed on the screen with a specific word "boxed-off." The learner must indicate if the word should be capitalized.
Comma Teacher's Pet cost $10	"As above," must indicate if a comma should follow the "boxed-off" word.
Adverb Teacher's Pet cost $10	"As above"
Identifying Complete Sentences Teacher's Pet cost $15	A group of words are displayed on the screen: the student must indicate if those words form a complete sentence.

Reading Diagnostic Program--Prescription and Remediation

PAL Reading Series Universal Systems for Education cost $200	PAL is intended to diagnos specific reading difficulties and provide remediation in those areas. Records can be maintained on up to 30 learners; the program will define a specific program for each learner to follow. Objectives include: phonics, grammar, parts of speech, meaning in context, reference tools, and reading for logic.

Miscellaneous

The Human Body: An Overview Brain Bank cost $80	This program covers a description of the human body through 8 topic areas, such as: the Muscular System, Digestive System, and Circulatory System. The program provides interesting reading in these areas. Comprehension is assessed.

Miscellaneous (continued)

American History: The Decades Game Brain Bank cost $50	Presented in a game format for 1-4 students, certain events will be listed in sequence. Students are expected to select the decade in which those events occurred.
U.S. Constitution Micro Lab Learning Center cost $30	The instructor can select various reading levels to match the learner's ability level. A series of reading passages are presented which cover basic facts related to the Constitution. Students are assessed for comprehension.

A copy of "Handbook for the Identification and Assessment of Computer Courseware for the Adult Learner," can be obtained from Advance: PDE Resource Center, Pennsylvania Department of Education, 333 Market St. Harrisburg, Pennsylvania. The "Handbook" contains a fuller description of listed programs and a review of other possible programs for use in remedial instruction. The programs which we selected for our CAI curriculum do not necessarily represent the best possible programs. It was our intention, however, that the programs listed could provide a reasonable opportunity to assess the effectiveness of CAI with current, popular courseware being purchased by school districts. The majority of programs included on our list were highly recommended in various journals as educationally effective. In addition, through our survey of courseware, we hoped to identify programs which would be more likely to appeal to adults.

Learner/Instructor Responses to Selected Courseware:

Feedback related to the perceived appropriateness of selected courseware was gained by (1) asking both learners and instructors their opinions of the available programs and (2) through direct observation of the programs actually used in classes.

It is interesting to note the differences and similarities between learners and instructors as to their impression of the subject area best suited for presentation on computers.

Adult learners' responses:		
- Reading Skills,	32%	(N=10)
- Language Arts,	25%	(N=8)
- Mathematics,	22%	(N=7)
- Games/Simulations	19%	(N=6)

Instructors' responses:		
- Mathematics,	75%	(N=3)
- Language Arts,	25%	(N=1)

A point of similarity is the rather low priority attributed to courseware used for educational gaming and/or simulations: most adults (80%) saw the computer as a means of providing basic skill instruction in a traditional drill and practice framework and instructors did not consider non-traditional applications (gaming & simulations) as the prime use for computers.

Although the sample size for instructors is small, it is somewhat interesting to note that adult learners tended to view the use of the computer to present reading, language arts, and math fairly equally while instructors felt that mathematics was best suited for presentation through the computer.

In respect to the actual assignment of programs by instructors and the voluntary selection of programs by adult learners, a correspondance between the perception of what subject areas were most appropriate on CAI and the selection of programs by adult learners and instructors was evident.

Adult voluntary selection:	
- Reading Skills	45%
- Language Arts,	15%
- Mathematics,	25%
- Games/Simulations,	15%

Instructor's assignments:	
- Mathematics,	55%
- Language Arts,	25%
- Reading Skills,	15%
- Games/Simulations,	5%

Through observations, some comments can be made on the reaction of both learners and instructors to the types of courseware which were available for use in our CAI Resource Center.

Mathematics--Instructional Level (1-4)

Compu-Math: Arithmetic Skills was rarely selected by adults and assignment by instructors eventually ceased. While this program may be extremely appropriate for elementary learners, the pace of instruction seemed to disturb adults. Feedback to adult students on their responses was often delayed by certain graphic or animated displays. Simply, adults wanted to move faster. The Microcomputer Workshops' materials worked well as it was not difficult to allow adults discretion in designing the type and number of problems they would work on. Control over the program (the ability to determine the number of digits which would be used in a multiplication problem, for example) appealed to students. It was also noted that instructors did not have to set certain difficulty levels which indicated to adults that they were labeled at level No.1, No.2, or No.3. The flexibility in designing problems by controlling the number of digits used did not seem to impress on learners that they were functioning at one level while other learners were functioning at another level. One problem with this series was that adults would have to direct the computer after each computational example as to the configuration of the next problem (constantly informing the computer of the number of digits which should be selected). This caused delays in instruction and promoted the tendency for learners to begin assigning more difficult problems before they adequately completed a sufficient number of problems of one specific type (for example, multiplication of a 2 digit number by a 1 digit number). Programs developed by Educational Activities worked well. Unfortunately, many of the questions had multiple choice answers which encouraged guessing.

Simple drill and practice programs, in general, worked better with adult students when there was minimal interruptions with extraneous graphics.

Mathematics--Instructional Level (5-8)

Adults at this level requested programs which attempted to use math skills within a realistic context. Programs like Survival Math, Money Management Assessment, Math and Your Personal Finances, and Banking & Consumer Tranactions were highly successful. Both Math and Your Personal Finances and Banking and Consumer Transactions were assessed as extremely appropriate for adult learners by the instructors. Programs available for enrichment (Solving Equations & Algebra Drill & Practice) were inappropriate. These programs were not able to provide any type of tutorial instruction needed to assist adults understand the basic concepts.

Both at the (1-4) and (5-8) instructional levels, programs functioned best as reinforcement. Providing adults with new concepts or principles was not deemed possible with the programs selected for our project. Nevertheless, when adults were assigned at a certain level, they were able to progress through different levels--or expand concepts. For example, if adult learners could work with multiplication problems dealing with multiplier and multiplicand consisting of two digits, through CAI with minimal instructor interaction, the learner could progress to solving problems with additional digits. The programs did not work adequately in explaining a new concept to adults, such as, solving long division when they were unsure of the basic operational principles.

Reading/Language Arts--Instructional Level (1-4)

At the (1-4) instructional level, the assignment of programs was difficult for the instructors. While the math courseware was easy to sequence, it was more awkward to readily fit courseware into the general instructional objectives of the program. The scope of programs like Consonants, Word Families, and Who-What-When-Where-Why were too limited to allow learners to expand on certain concepts after they were introducer by the instructor. A major advantage of the Hartley series is the potential for teachers to modify programs--selecting their own questions, modifying vocabulary--however, time restraints basically eliminated any opportunity for teachers to take advantage of this feature.

Several programs were favorably viewed by both adults and instructors. Comprehension Power (Levels A-C) were the most used programs at this level. An interesting feature of this program was the ability of the learner and adult to set the speed by which passages would appear on the video screen. This provided an opportunity for students to gauge their progress. The stories used were extremely appropriate for adults. In addition to interesting topics and the use of basic or appropriate vocabulary for remedial learners, the sentence structures were better matched for adults (longer, more flowing, rather than short statements). Adults, in fact, enjoyed talking about learning to "speed read," which conveys less of a negative tone than mastering reading skills at the 3rd grade level. A design characteristic of this program which appealed to instructors was the multiple activities incorporated in the courseware. Part of the program addressed spelling while another part covered aspects of comrehension; therefore, in addition to providing variety to students, the instructors could use the same program to address different instructional objectives. The Cloze Technique and Vocabulary Builders, by Orange Cherry Media, was highly used by teachers.

The courseware available for CAI was suitable for adults at the 3rd or 4th grade instructional level. Using computers with adults who were functioning at a minimal reading level was difficult. First, adults at this level had problems understanding the directions independent of the instructor. Secondly, instructors had limited selection of courseware which was preceived as effective in expanding concept formation. This was perhaps the most difficult instructional level and subject area to provide meaningful experiences via the computer. As indicated earlier, many of the programs available in our courseware library at this instructional level used gaming strategies. In nearly all these cases, the gaming format was higly inappropriate for adult learners.

Reading/Language Arts--Instructional Level (5-8)

The available reading programs selected for this level (Active Reader, Adventures Around the World, How to Read in the Content Areas, Comprehensive Power (Levels D-F) and Reading Comprehensions: What's Different) were popular with students. These were the most frequently requested or selected programs by adults in this general curriculum area. Adults tended to favor stories, as with math, which dealt with relevant information. Reading in the Content Areas was the singularly selected program; many adults felt that the topic areas (social studies, literature, science, and math) would assist them in preparing for the GED program. Although humorous stories were selected and assigned, reading exercises which centered on factual information were preferred. Two features in these programs appeared to be highly appropriate for adult remedial learners. In general, only a few questions were asked related to a particular skill, such as, recall or inference. The emphasis was on personal enjoyment rather than assessment. When a question was missed by the learner, the program would automatically retreat or return to the specific passage which the learner needs to reread in order to answer the question. In effect, the learner is not frustrated by being required to read the entire story to find the correct response.

One drill and practice program which was favorably perceived by both instructors and learners was Spelling Builder. In this program the addition of tutorial, or instructive elements (certain basic rules to guide students to identfy correctly spelled words) was a feature which made the program more appealing. Teacher's Pet are simple drill and practice programs. They were some of the least expensive programs available in the computer laboratory. These programs may be appropriate for elementary students but they were poorly designed for adults. In Comma, for example, a sentence would appear on the video screen; through random selection a particular word would be "boxed-off," and the learner would be asked to indicate if that word should be followed by a comma. Since the questions are selected by random, often the learner is not actually challenged by the exercise; in fact, some of the responses are ridiculous and fail to assess the learner's understanding. If the learner was presented with a sentence, such as, JOHN WENT TO THE STORE AND SAW HIS WIFE SPENDING ALL HIS HARD EARNED MONEY, it would seem appropriate to assess if the learner knew that a comma should not come between "STORE" and "AND." In programs which generate questions by random selection, learners may be asked if "WENT" should be followed by a comma. This type of questioning does not contribute to increased understanding. Generally, when adults were assigned these programs, they quickly became bored. More importantly, regardless of the number of correct responses, instructors could not be sure of the learner's grasp of the rules for the comma.

Punctuation No. 1 & No. 2 by Educational Activities were better received. As in the case of Spelling Builder, learners referred to a set of rules which was intended to assist in understanding why a comma or period may have been used incorrectly. The tutorial or instructional information contained on these programs was not sufficient to instruct students in the basic rules for punctuation, but when combined with other activities guided by the instructor, they formed a good instructional unit. Programs which included some tutorial information in addition to drill and practice exercises were more often assigned by instructors and selected by learners.

One program available in the computer center was the PAL Reading Series by Universal Systems. This system has received notable recognition in several microcomputer journals. In one microcomputer catalog, the following description is used:

> PAL goes a revolutionary step beyond the "drill and practice" method of other programs. PAL diagnoses the causes of the problem and provides remediation for those specific difficulties. PAL teaches reading by evaluation, diagnoses, prescription and remediation directly targeted at each reading problem. A customized program can be developed for each child, and records can be kept for up to 30 students. Objectives include grammar, parts of speech, phonics, meaning in context, study skills, use of argument, use of evidence, and student familiarity with reference tools (American Micro Media, 1983, p.34).

If fact, the PAL system deals with approximately 35 major skills required in reading and over a hundred sub-skills. The program will list the skills the learner appears to have mastered, such as: identifying single consonants, medial consonants, blends, digraphs, silent letters. The program will then indicate to the learner the skill areas, or instructional objectives attempted but not mastered such as: diphthongs, prefixes, suffixes, and plurals. Finally, the program will present a listing to the learner of the skills he/she has not yet attempted but must master. In short, the program sounds impressive and highly relevant for ABE classes.

There was, however, a problem in using this program which is important for adult educators to appreciate. The actual quality of courseware can not be the sole criteria for use in ABE classes. In evaluating courseware for adult classes, it seems obvious to identify programs which offer the best design features incorporating a sound instructional content. Yet, a vital consideration is missing. It is essential that the ease of operation is an element in the selection process. Simply, in ABE classes, a teacher's time is divided--or managed--between the needs of fifteen learners. Courseware which requires a high degree of teacher time for the basic operation of the program may be counterproductive in that the teacher as a resource to other learners is being restricted.

The PAL system is designed to operate on a dual disk drive system. It can, nevertheless, run on a single disk drive system which was the case in our CAI Resource Center. Complications which arose from this procedure made it difficult for students to use without direct assistance from the instructor. Further, remedial work which was assigned by the program, based on the learner's responses, was minimal. In order to work effectively, the instructor would need to add supplemental activities.

In classes with small enrollments, three to six students, it may be highly appropriate to use this type of program. However, the class size for ABE classes restricted the time which the instructor could allocate to activities which basically centered on a single learner. When class size was reduced due to absenteeism, instructors attempted to use the program to assess certain reading skills. Although adults were intrigued with the printed diagnostic report, it was hard to see how teachers would follow-through on the assessment. The program is designed to be used in an ongoing process: a part of the regular instructional activities for the learner. Due to the interactive time required, teachers could not be sure that time would be available on a regular basis.

Some observations may be of interest in respect to the programs which were listed under miscellaneous. The Human Body, by Brain Bank, was one of the most popular programs with ABE students in the (5-8) instructional level. Basically, this program was considered as enrichment material. It was used as part of the reading program. Graphics used in this program were associated with the content information and not added for entertainment. In both this program and Reading in the Content Areas, the very act of reading was directed towards accessing information related to some clearly identifiable subject area, such as, social studies or human physiology. The U.S. Consititution was also heavily used by instructors and students. It was seen by the instructors as an appropriate activity for developing reading comprehension.

Several educational games were available in the computer center but the most popular was American History by Brain Bank. Instructors did not generally assign this program as an effective activity for understanding history, but for developing reading comprehension. The program simply stated brief sentences describing a certain historical event. The learner was required to guess the decade in which that event occurred. If the student failed to indicate the proper decade, additional statements would follow outlining other events which also occurred in that decade. As a program designed to heighten a learners appreciation of history, it could be considered weak: no attempt is made to develop in the learner a sense of awareness of the implications and impact of events. However, the program was determined to have value in terms of providing a reading activity and could stimulate a dialog related to certain events or follow-up work.

What distinguished this program from other educational gaming programs was the lack of any animations or graphic. Positive reinforcement from the computer for correct responses was subdued in comparison to other games.

Summary: Selection of Courseware for Adult Learners

Simple programs designed to provide drill and practice, particularly in mathematics, worked effectively at the (1-4) instructional level. At the (5-8) instructional level, instructors and learners, oriented towards programs which provided some tutorial or instructive information, within the context of drill and practice exercises.

At both the (1-4) and (5-8) instructional level, graphics and/or animations used in programs for entertainment were not appreciated by adult students. (Please note* -when adult students were originally exposed to a program with a certain graphic sequence, the first reaction was generally favorable. However, after repeated exercises on that program, adults appeared to be disturbed by the interruptions. The programs voluntarily selected by adults tended to be those programs which did not employ extensive use of graphics and animations.

Graphics used in conjunctions with instructional content were well received. In the Human Body, for example, the graphics demonstrated concepts outlined within the text of the program. This type of animation or graphics was appreciated by adults. American History: the Decade Game was the popular educational gaming activity for adults; it did not employ graphics or animations.

Designing courseware to randomly alter questions is generally considered a positive feature in evaluating CAI programs. It was noticed that random selection which results in questions that fail to challenge learners is quickly disregarded by both students and teachers.

A further problem, not addressed previously, was the difference between the instuctors' and students' use of disk and cassette operated systems.

At the start of the project, three computers had disk-drive systems and five computers were loaded with a cassette tape recorder. On the tape operated programs, it was difficult to load reading programs simply due to the time required. Many of the math and language art programs required less than three minutes to load when using a cassette tape recorder; however, reading programs might require five to ten minutes. If the instructor did not have a tape reading program loaded into the computer prior to the start of class, it was difficult to find an opportunity during class to load those programs. These taped reading programs presented problems for students. Most of the malfunctions associated in loading programs occurred with these series, students often reported frustration about the time required to load taped reading programs.

Therefore, reading programs were generally only used on the disk-drive systems. Since there were less disk-drive systems at the start of the project, the instructors had a tendency to assign more of the math programs. It should be noted, as the project progressed the cassette recorders were gradually replaced by disk drives. This naturally eliminated this problem.

Based on our observations, the type of courseware we recommend are:

- (1) programs which allow ease of application in loading, e.g., those which are disk operated rather than cassette;
- (2) programs which avoid extraneous graphics and animations;
- (3) drill and practice programs which include some instructive or guidance information for solving problems; and,
- (4) at the (5-8) instructional level, drill and practice exercises which relate to practical or realistic encounters which adults may need to deal--or associated with the GED requirements.

Non-Traditional Instructional Strategies Using CAI:

Simulations may be the unique application of computers in education (Rosenfeld, 1975: Greenblat, 1975). Modeling real-life situations, such as, operating a business, dealing with social conflict, planning household management, and coping with emergencies; simulations can allow adult learners an opportunity to explore elements of decision making.

Based on the materials available at this project site, simulations could not be effectively used with adult students. The problem was the failure to identify simulations which were appropriate for remedial adult students. In general, the directions involved in working most of the simulations required extensive instructor assistance in explaning the procedures for operation. If a large video screen would have been available for group demonstrations or explanations, more activities related to simulations may have been possible. However, the time required to work individually with adults to explain or clarify the handbook of instructions accompanying many of the simulations made presentation of simulations impractical.

As with other courseware, many of the popular simulations touted by educators were available.

Three-Mile Island, by Muse Software, was cited in Purser's Magazine as a classic and recommended that every school should have a copy (American Micro Media, 1983, p.32). Other currently popular simulations, such as Terrorist and Windfall: The Oil Crisis by Edu-Ware Services have similar characteristics to TMI.

These simulations are directed, it appears, at "gifted" high school students. The directions for operation are difficult for teachers to comprehend. Having adult remedial students use these types of programs require considerable interaction with instructors in clarifying rules and procedures.

One series of programs which were anticipated as being more appropriate for adult learners was What Would You Do? Simulations in Social Studies: Elementary Vol No.6, by Minnesota Educational Computing Consortium. Five separate programs are included in this volume:

- Furs, a simulation of the fur trading business in the 1770's;
- Nomad, a game in which students are given a map of a city and and try to drive to a given intersection;
- Oregon, a simulation in which you are responsible for traveling in a covered wagon across the country to Oregon City in 1847;
- Sumer, given a kingdom, students are required to make certain decisions related to the general economic welfare of the state. This program requires the student to use certain math skills;
- Voyageur, a simulation about fur traders traveling from Lake Superior to Rainy Lake.

Adult interest in these programs was basically low; Oregon, however, was more appreciated. Each program comes with a detailed Teacher's Support Booklet which supplies background information for using the program in the classroom. Worksheets are also included with these programs to provide activities for students. Some of the worksheets can be used independent of the computer. Instructors felt that the programs could be used to present interesting educational concepts if correctly used.

The problem was that adults could not use these programs without the teachers carefully explaining the instructions. Time was not available for this type of individual attention.

Educational Gaming, like simulations, have been recognized by educators as instructional tools since the late 1960's (Becker, 1982, p.38). The computer is recognized as a highly effective medium for presenting games which could be directed at developing basic skills.

> (Computer) games are fun. Students, as well as adults spend hours with them. They serve a very important educational motivational purpose for many students. In addition, if the programs are well designed, they assist students in developing process thinking strategies (Joiner et al, 1982, p.125).

Gaming computer programs available for adult students were extensive. Programs by Data Command and Muse, highly rated in various journals, were used in classes. The programs available from Data Command were Tennis Anyone, Riddle Me This, and Alpine Skier. In fact, when adult students were requested to indicate their favorite programs, two students selected the Data Command collection. Instructors were impressed with the instructional content of these programs, but there were perceived problems in their use in classes.

Adults were generally impressed with the graphics or animations. In Alpine Skier, after each correct response, an animated skier would successfully navigate down a mountain. However, if the learner missed the correct response, the skier flipped through the air and crashed. This graphic display is entertaining and enjoyed by both instructors and students. Nevertheless, after several series it becomes boring. While the games made a strong first impression, adult students soon tired of the graphics.

Many of the educational games, if not most, were designed for elementary learners; the graphics are designed and directed to this audience The use of computer games was limited due to the inappropriateness of the graphics.

The most popular educational game in the computer software library was American History: The Decade Game, this program did not use animations or graphics. A positive feature of games is that they usually involve two or more students. This creates a social interaction. Unlike simulations, most of the gaming programs were easy for adults to operate without extensive teacher assistance.

Traditional Instructional Strategies Using CAI:

An early objective of this project was to assess the effectiveness of CAI in presenting tutorial instruction:

> These application programs are without doubt the most complicated to write. Their purpose is for students to acquire specific knowledge through well designed linear and branching frame sequences (Joiner et al, 1982, p.125).

Tutorials are designed to follow the traditional lecture method of instruction. "Information is presented in an organized fashion, including frequent one-to-one reinforcement, as the learner responds" (Douglas & Neights, 1981, p.13). Although research findings have supported the effectiveness of CAI in presenting drill and practice, there is not much empirical support for CAI in presenting tutorial instruction (Merrill, 1980; Ragosta, 1981).

Programs available at this project site could be classified as limited tutorial programs. In Punctuation No.1 & No.2, by Educational Activities, minimal tutorial dialog was built into the program. Brief statements would appear to the student if a certain response was incorrect. These informational displays were intended to offer some guidance for learners in correcting their error. This type of programming typified the tutorial programs available for adult students and is far removed from the kind of program design which is necessary in order to use the computer as a replacement for a classroom teacher. When many authors are discussing tutorial programs, they appear to be referring to the type of programs funded by the National Science Foundation in the 1970's. The TICCIT project was designed to allow students control over the extent of information they required in order to comprehend some concept or rule. These programs required computers with a large memory capacity. The mini computer systems used in the 1970's could easily accommodate this demand. The mircocomputer, early models and many models currently present in schools today have limited memory. This makes tutorials not practical to attempt to program. How effective tutorials may be in adult basic education can not be inferred from this project. The programs used in this project would be better described as drill and practice designs with limited dialog or interactive information.

In a sense, many of the popular microcomputer programs could be labeled as "pure" drill and practice (students are given certain questions to which they must respond) or drill practice programs with limited interactive dialog (students are given certain questions, based on their response, some dialog will be displayed in order to assist students in understanding why their response was incorrect or even why it was correct).

At the (5-8) instructional level, drill and practice programs with limited dialog was consistently preferred by both instructors and adults. The Human Body, by Brain Bank, is an excellent example. The information contained on the program allowed instructors to engage adults in activities which were stimulating and productive. Meanwhile, the instructor could direct attention to other student's needs.

Few programs, however, available for mathematics were able to present new concepts to adults. Addition With Carry, by Microcomputer Workshops, for example, could not be used to present carry-over to adults who did not understand the concept. If the concept was introduced by the instructor, the program did provide good reinforcement.

The computers could not be used as a replacement for teachers in presenting tutorial programs. It was important for instructors to become familiar with the programs in order to properly assess their advantages and disadvantages. With careful planning, instructors could prepare instructional units which employed CAI as supplemental or enrichment activities.

Drill and practice was the most commonly used instructional strategy through the project period.

> The distinction between drill-and-practice C.A.I. and tutorial C.A.I. is arbitrary. Drills shade into tutorials as the mode changes from repetitive computer-asked questions and student answers to the presentation of new information displayed on the computer screen....(Becker, 1982, p.27).

At the (1-4) instructional area, particularly in mathematics, adults were able to make progress on mastering basic compentencies with limited, but necessary, teacher guidance. In addition, regardless of how simple the design of the program (lacking graphics, limited positive feedback,etc.), adults were motivated to complete assigned work.

Adults at the (5-8) instructional level preferred drill and practice programs with tutorial, or limited, dialog statements.

Interestingly, courseware used in conjunction with traditional instructional materials was favorably reviewed by adult students. Money Management, by Interpretive Education, is promoted as an educational package designed to reinforce, or build, skills related to practical life situations. However, the courseware, itself, deals with simple drill and practice exercises related to basic computational skills and vocabulary building. Supplemental worksheets used with this program does stress practical application. Used together, the

the overall quality of the instructional unit is enhanced. Simply, a computer program considered dull by teachers was appealing to adults when integrated with interesting traditional instructional materials.

Summary

Although multiple instructional strategies are discussed in connection with CAI, in actual application in an instructional setting for adult learners, only drill and practice is easy to effectively integrate in ABE classes at this time.

Simulations have a tremendous potential for including activities related to decision making. In addition, ABE classes which have access to only one computer could provide this type of activity providing a large video screen/monitor is available for group presentations.

The programs which were available at this project site were not appropriate for remedial learners. Many of the popular simulations being promoted by distributors and praised in computer journals are better directed for "gifted" secondary students. The directions for operation of simulations were complex. Adult remedial learners would likely require a high degree of assistance from an instructor in order to operate the program.

Educational games marketed for CAI seem directed to elementary students. The graphics and animations used in the format quickly become distractions for adult students. Games without extraneous displays would likely be better appreciated by adults.

Tutorial programs are limited in terms of what can be successfully presented independent of assistance from instructors. The programs used in this project are better viewed as drill and practice exercises with varying degree of interactive dialog. The computer could not be used as the sole means for presenting an important instructional concept, such as, usage of commas, long division, fractions, etc.

In providing drill and practice exercises, however, many programs can be appropriately used in ABE classes. At the (5-8) instructional level, it was not difficult to find an adequate selection of courseware for presenting supplemental activities for the basic instructional disciplines. At the (1-4) instructional level, it is more difficult to find appropriate programs for beginning reading and language arts, but their are a number of good programs available for presenting mathematics.

Integrating CAI in Adult Basic Education: Hardware

> Regardless of how capable microcomputers may be for giving students practice with drills...their theoretical capabilities are irrelevant if they cannot be used effectively by teachers and other school personnel in the ongoing activities of existing educational institutions (Becker, 1982, p.56).

There is somewhat of a paradoxical element in attempting to integrate CAI in Adult Basic Education. The class size specified for instruction, at best, results in a student/instructor ratio of 15 to 1. While this is an adequate class size for group directed instruction, it may pose problems in planning individualized instructional programs for each adult student.

The microcomputer, historically, has been viewed as an effective means for individualizing instruction. The computer, considering the size of the video screen, is appropriate for one, perhaps two, students. Usually, courseware is generally designed to be operated by one learner.

Integrating CAI in ABE classes requires a balancing between group centered and individual centered instruction.

Computer assisted instruction could be used both within the context of the 200 hour instructional program and in a supplemental extention to the total instructional time allocated for ABE programs.

Within the context of 200 hour instructional program, three approaches could be considered: Undivided Group Assignments, Divided Group Assignments, and Independent Assignments.

Undivided Group Assignments would be the approach most easy to initiate. Simply, the entire ABE class is assigned to work on computers part, or all, of the class period. Naturally, in order to implement this approach, it is necessary to have a sufficient number of computers available--ideally, one computer for each learner. Also, it would be important to have a system which permits quick and easy loading of the computers. This may involve a networking system. As previously discussed, courseware which is copy protected may not be compatible to multiple loading in a networking system.

If hardware and software related problems are resolved, there is still an important issue to consider in this approach. How do we define the role of the instructor? Ideally, we want to use the computer (or any other instructional device) as a means to effectively reallocate teacher time. If microcomputers can be used in a manner which increases the activity of the teacher--the ability of the instructor to more meaningfully interact with learners--this medium has tremendous potential for education. However, it is crucial that CAI does not result in a passive role for teachers. There is an obvious danger that in an Undivided Group Assignment the instructor will function as a super monitor or technician.

This approach, however, may be advantageous in terms of orienting adults and instructors to CAI. While administrators/coordinators may be sensitive to the anxiety that adults might experience in first using computers, it is also important to be conscious of the fact that teachers with limited experience with microcomputers are likely to feel uncomfortable. The Undivided Group Assignment creates an easy situation for teachers to manage and plan.

Divided Group Assignments requires that an instructor is able to manage two or more groups simultaneously. While the instructor is working with a small group (perhaps one-half of the ABE class), the other group is assigned to various computer stations. In respect to hardware, this approach could be used with half the number of computers which would be necessary in the Undivided Group Assignment approach. The very nature of creating divided group work imposes more work, effort, and planning by teachers. There is an added demand with CAI. Teachers need to have the equipment work smoothly when they working with groups away from the computers. If the teacher is being regularly interrupted by students due to technical problems related to the computers--problems with loading programs or understanding commands/directions to operate various programs--adults working with the instructor, independently of the computers, may perceive this situation as a secondary learning experience: merely busy work to fill time until the computers are free for their use.

In order to implement Divided Group Assignments, teachers need to be highly proficient in running computer hardware and software. However, this approach is more consistent with our discussed rationale for CAI: effective reallocation of teacher time. In essense, this approach allows the teacher to begin to consider what the computer is capable of doing effectively and what the teacher can do effectively with students.

Individual Assignments is an approach where the teacher is permitted a high degree of flexibility in integrating CAI. Rather than manage the class in terms of groups, instruction in planned in terms of individuals. Although this approach is most consistent with the literature on effective instruction for educationally disadvantaged learners, it is extremely difficult to realize in practical application. It was noted that with the Divided Group Assignment approach, the instructor needed a strong background in the basic operation of computer equipment and courseware. In addition to understanding the technology, with Individual Assignments the teacher must be sensitive to the needs of the individual learners.

At this project site, it was observed that assignments for CAI would vary depending on the teacher's experience with computers and, also, with subject area.

One instructor involved in this project was familiar with CAI for remedial learners. This teacher worked in Title I/ Chapter I programming at the elementary level and regularly used computers as a part of the basic remedial program.

At the start of this project, only the teacher with experience, or exposure, to CAI in a remedial setting was readily able to implement Divided Group Assignments. The three staff members with limited exposure to computers had problems in attempting to manage divided group work through the early phase of the project (the first twenty-five hours of the project was considered the early phase). One problem which was somewhat difficult to resolve for the inexperienced staff members was related to time management. Inservice training was directed at providing the instructors with a basic understanding of computer hardware: simply, how to run the machines. In respect to courseware, instructors were provided with evaluation sheets of the courseware library available for instruction and offered some time, although limited, in previewing software. While the evaluation sheets had an indication of the time required to complete the program, this was inadequate information for the type of planning involved in dividing work groups. Generally, when groups were divided, the group at the computers had finished their assignments before the instructor anticipated. This created dead time for the students assigned to the computers. The difference between staff members, the teacher who was experienced with CAI and the three instructors who had limited exposure, was the foresight the experienced teacher had in matching the time required to complete activities at the computer stations with the time required to finish the teacher directed small group activities.

Most courseware developed by independent producers are relatively brief in duration (10 to 20 minutes). Courseware designed to allow students to easily alter the program, schedule additional problems/questions at the same or different difficulty level, can provide additional activities for students without direct intervention by the instructor. Strategies which were used to balance time limits between adult groups on the computers and those working with the teacher invloved:

(1) assigning supplemental activities with CAI, such as, traditionally designed teacher work-sheets (some courseware packages have workbook type activities included with their program); and,

(2) assigning students to several computer stations, for example, one series of computer stations may cover some Language Arts activities while a second series of stations may be programmed for mathematics.

How ABE students will be assigned to CAI is not an administrative decision which can be made in the absence of an appreciation of the instructor's understanding of the technology and individual needs of the learners. We observed that without sufficient background experience with CAI, it is difficult to immediately plan multi-group activities. Integration of CAI should be viewed as an evolutionary process: teachers require time for hands-on experience with computers and in understanding the needs of their students, academic and psycological. When this project was initiated, an administrative decision was made to use computers in a type of Divided Group Assignment approach. However, three out of four teachers were not prepared to adopt this approach. The fact that an observer was reporting on a regular basis about the operation of classes enabled administrative personnel to reassess their imposed instructional design. Although the Undivided Group Assignment approach may have some instructional flaws (less likely to result in an efficient and effective reallocation of teacher time), it was an easier approach to initially orient teachers and adults to CAI. After approximately twenty-five instructional hours, three teachers were adopting a Divided Group approach and capable of managing split group activities; however, one teacher throughout this project basically relied on full-group activities at the computer stations.

The CAI Resource Center had eight computers; therefore, in order to conduct Undivided Group Assignments, it was necessary to assign two students to some of the computer stations. This did not seem to disturb adult students or teachers. A consideration in implementing CAI for adult education should involve an appreciation of the number of computer units which are available. While four or five computer stations may be adequate for Divided Group Assignment and Individual Assignment, that number would be insuffient for Undivided Group Assignments. It was noted that staff personnel with limited experience with CAI had problems in initially attempting to divide their attention between two groups of adult learners: those using CAI and those working with the teacher in small groups. Unless ABE personnel are familiar with CAI through other instructional experiences, it may be difficult to initiate CAI with a small number of available computers since an effective strategy for orienting inexperienced teachers to CAI, Undivided Group Assignment, would be hard to arrange.

It was inferred that Individual Assignment was a type of ideal goal: the matching of resources (human and instructional materials/equipment) on an individual basis depending on the needs of the learners. Yet, this approach may be flawed as an initial introduction for CAI in Adult Basic Education classes. If an administrative decision is made for ABE instructional staff to adopt an Individual Assignment approach, the actual outcome of how computers are used may be more related to the teacher's perception of the medium as an effective instructional device rather than the particular needs of the learners. In order for the Individual Assignment approach to be effective, it was indicated that teachers needed familiarity with the technology and the particular needs of the students. At the start of ABE classes, it is doubtful that teachers would have the insight to determine which students would progress better with CAI rather than direct teacher interaction and what ratio of teacher-assisted/ computer-assisted instruction would be optimal for each learner. For the Divided Group Assignment approach to work, teachers need to master basic routines related to computer equipment and courseware management; for the Individual Assignment to work, teachers need, in addition, to understand the learner's needs.

If a decision is reached by ABE staff (administrator and teachers) to use CAI, a general framework for implementation should be set which maximizes the use of computers. The Individual Assignment approach provides a high degree of discretionary power to the teacher in assigning learners to computer stations. However, teachers who are not familiar with CAI may tend to misuse the technology by either under-or over-assigning certain students to computer stations. Undivided Group Assignment may result in computers being used only a portion of available class time; in addition, the teacher might accept a passive role while the entire class is assigned to computer stations. The Divided Group Assignment, as an implementation strategy, is designed to fully use all available resources for instruction. In this approach, the computers should be in operation through the entire class period. The teacher defines what role the computers could fill which is unique to that medium and, more importantly, what role is unique for the teacher.

If ABE teachers are experienced with CAI, the Divided Group Approach seems most likely to produce favorable outcomes in respect to resource utilization. We stated that when teachers are not familiar with CAI, the best way to implement the Divided Group Approach may be through an orientation period (25 hours) which is based on an Undivided Group Assignment. Although Individual Assignmeht may be viewed as an ideal instructional strategy, it is advised that this integration strategy develop through a Divided Group Approach.

Integrating CAI in Adult Basic Education: Courseware

Ironically, the most essential question related to the effective use of computers, as an aid to instruction, is rarely raised. Educators frequently fixate on one problem area in considering integrating CAI into instruction. The concern cited most often is related to the availability of quality courseware. In the section entitled, "Courseware Selection for Adult Education Classes," we indicated some of the courseware which was available in our CAI library for use with adult learners. However, based on our experience, the quality of the courseware--to a degree--may not be as important as the teacher's ability to integrate available courseware in an ongoing educational program. Simply, teachers need to view courseware in terms of what that program can offer in conjunction of what the teacher can offer. True instructional integration is dependent on an objective appraisal of the potential and limitations of CAI within the context of the present instructional staff. The central question is, what can the availability of computers for instruction permit the teacher to do which was not previously possible? CAI must be assessed in terms of how the teacher's time can be effectively reallocated.

Many of the programs that were previewed at potentially desirable for ABE classes were, in fact, inadequate because they required a high degree of teacher interaction with students in order to explain or guide the student through the program. Rather than freeing the instructor, some programs entangled the teacher at the computer station. Several simply designed drill and practice programs, not typical of the "state of the art" in courseware design, worked well. These programs did not require excessive teacher guidance or assistance in operation; therefore, it was more feasible for our instructional staff to rearrange their role: working with smaller groups, limiting instructional time required for presenting or grading drill exercises, and time necessary for testing.

Crucial in the selection of courseware is the utility value of the program for the instructor. Factors which relate to the utility value are:

(1) overall instructional purpose;

(2) academic and psychological needs of the learners;

(3) staff experience, exposure, to CAI;

(4) teacher/student class ratio;

(5) quality/quantity of available hardware;

(6) capacity of students to work independently on computers; and,

(7) securing additional assistance through instructional aides or peer teaching.

Realizing that courseware usability is conditioned by factors related to the instructional environment is essential in planning effective integration of computer assisted instruction. In reporting our project, we began by indicating some "unanticipated problems." In respect to staff preparation, it was indicated that teachers required time to personally preview courseware. Providing teachers with detailed evaluation sheets related to the instructional content and technical design features of courseware is necessary, but not sufficient. Teachers need to develop a repertoire of experiences based on matching courseware to the instructional settings.

Depending how courseware is matched with the instructional setting will ultimately define the utility value. It may be convenient to consider this matching process in terms of three possible instructional modes.

The first instructional mode might be called A.M. (Amaze and Mystify). A program which functioned in this type of mode for our instructional staff was the PAL system. We previously described problems with the use of this program. Basically, while the program represents the "state of the art" in software development, it had limited utility value for our staff. Primarily, the teacher/student ratio in our ABE classes prevented the teacher to allocate sufficient time to each individual student to make this program appropriate. Also, the quality of the hardware was inadequate. The program was intended for use on a dual disk drive system; operating the program on a single disk drive required more direct teacher attention and limited the potential for students to master the operation of the program without assistance from the staff.

Although the program was impressive: providing a detailed listing of student skills and deficiencies, it was extremely difficult for teachers to use the information provided through this program. Therefore, it functioned more as a gimmick to "amaze and mystify" rather than an integral element in instruction. This, of course, was not the aim of the producers of the courseware or the instructional staff in our ABE program.

A second CAI instructional mode might be termed R & R (Rest and Recreation). Rather than instructional integration, in this mode the computer is used to offer supplemental activities. These activities, however, are not fully planned in terms of the teacher's instructional lessons. In a sense, the teacher relies on traditional instructional strategies to present or reinforce certain concepts. The computer is employed as an auxiliary instructional device--a type of "rest and recreation" from the ongoing instructional program.

The final instructional mode will be referred to as P.M. (Prepared and Managed). This mode involves a combination of strategies, traditional and CAI, to present certain instructional lessons. In this mode the teacher perceives a specific role for the computer in the instructional plan. In fact, the computer is a basic element in the ongoing instructional program. In order to implement this instructional mode, the teacher requires a clear understanding of the courseware potential for meeting certain educational objectives. The understanding of how to use available courseware may be more important than the overall quality of courseware. This is not to imply that an experienced instructor in the use of CAI can negate problems associated with poorly designed courseware. Rather, our point is to emphasize the importance of staff being able to prepare and manage courseware for integration into the basic fiber of instruction.

Courseware used in the A.M. mode is a waste of both the teacher and student's time. It is essential to constantly ask what instructional goal is being addressed by the courseware. Is the program serving a valid purpose? The problem which may arise related to the A.M. mode is that the overall evaluation of courseware (content and design) is somewhat independent of the actual utility value of the courseware. It is important to keep-in-mind that the utility value is not a constant. The instructional environment can be altered to increase the utility value of courseware. In the example we used, the PAL system would have been more functional if the teacher/student ratio was reduced, or if students were better able to use the program independent of direct teacher interaction.

Courseware in the R & R mode is not necessarily a waste of the student's time. The problem is that the teacher is not using the available technology to reallocate their instructional time. In the R & R mode, the computer will more likely appear to be additional work for the teacher, an additional activity to plan and present.

The difference between the P.M. mode and the R & R mode is instructional integration. In the P.M. mode, the teacher has asked what role the computer can fill which need not be duplicated through other instructional activities. Only in this mode is the teacher able to reallocate their time. The computer does not respresent an additional activitity to be prepared, but a substitute for a previously planned instructional strategy.

It was mentioned that there was a tendency for teachers to progress from Undivided Group Assignments to Divided Group Assignments. Likewise, teachers tended to move from the A.M. mode to the P.M. mode; however, the subject area was a factor in the selection of an instructional mode.

There has been some comment in computer related journals expressing concern that teacher's may have a misconception of seeing the computer as a super calculor; thus, the strong emphasis on using CAI for presenting some aspect of mathematics:

> A survey of school districts in Pennsylvania showed that 394 schools used CAI in the curriculum area of math compared to 124 schools which employed computers for reading and 72 school districts which used CAI in the curriculum area of Language Arts (Benedetto & Ju, 1983, p.16).

> It was observed in association with this project that instructors (3 out of 4) felt the computer was more appropriate for presenting mathematics and a record of program assignments demonstrated that instructors assigned math programs 55% of instructional time compared to reading 15% and Language Arts 25%.

However, it was our observation that the curriculum area of mathematics was easier to present in the P.M. instructional mode: incorporating CAI as a substitute for other traditional instructional strategies. A computer program which presented various difficulty levels of a basic mathematical function, such as addition, subtraction, or multiplication; was likely to used in place of workbook sheets or teacher developed materials. Also, the teacher was better able to allocate drill and practice exercises in these skill areas to the computer while finding other instructional activities which were more appropriately directed by the teacher. Assigning and recording student work for the computer related to math was not difficult for teachers to manage. In some cases, it merely involved monitoring the rate at which students progressed through various difficulty levels. Both Divided Group Assignments and Individual Assignments were easy to arrange for presenting mathematics.

This was not the case for reading and Language Arts. The courseware available in our computer library could best be described as piecemeal. Unlike mathematics, it was not possible to easily present a specific skill associated with these instructional areas and arrange various difficulty levels suitable for progression through different grade levels. Simply, the courseware was not comprehensive in these subject areas. Although many of the reading programs and Language Arts were instructional sound, they were likely to be used to provide enrichment activities.

The use of the computer in the R & R mode (supplemental activities) was defined as a more time demanding instructional mode for teachers. The computer is not employed as a substitute to other instructional strategies, but as an addition to those activities. This tendency may be a factor in the motivation by teachers to use CAI in the subject area of mathematics.

Summary: Integration of CAI

Divided Group Assignments and Individual Assignments provides the structure which is most likely to result in the effective and efficient use of both the teacher and computer as resources in the learning process. Integrating CAI as a basic part of the instructional program (P.M. mode), rather than a supplemental activity (R & R mode), is consistent with the concept of reallocation of instructional time.

We have observed a tendency with the staff involved in this project to plan and present instruction in which the role and function of both the teacher and computer are arranged to increase small group interaction between the teacher and students and, in the curriculum area of mathematics, free the teacher from instructional activities related to drill and practice exercises associated with basic computational skills.

Attitudes of Students Towards CAI:

Adult students responded positively towards CAI on attitudinal measures. Prior to the implementation of CAI, adults expressed both interest and willingness to use microcomputers as part of their instructional program.

During the last two weeks of classes, adults were asked to anonymously complete a survey designed to assess attitudes. Adults responded to certain statements using a Likert-like scale to record attitudes.

Statement No. 1

I enjoy working on the computer rather than using workbooks or using teacher-made study sheets.

Response:

- 58% (N=18) strongly agree
- 38% (N=12) agree
- 4% (N=1) disagree
- 0% (N=0) strongly disagree

Statement No. 2

The computer is better at providing games than really helping me learn basic facts about math, language, or reading.

Response:

- 4% (N=1) strongly agree
- 13% (N=4) agree
- 48% (N=15) disagree
- 35% (N=11) strongly disagree

Statement No. 3

Lessons on the computer are generally confusing and difficult to understand.

Response:

- 0% (N=0) strongly agree
- 4% (N=1) agree
- 80% (N=25) disagree
- 16% (N=5) strongly disagree

Statement No. 4

If I had a choice, I would spend more time on the computer than on other instructional activities.

Response:

- 46% (N=14) strongly agree
- 48% (N=15) agree
- 6% (N=2) disagree
0% (N=0) strongly disagree

Statement No. 5

I enjoy learning on the computer rather than through other types of instruction.

Response:

- 19% (N=6) strongly agree
- 77% (N=24) agree
- 4% (N=1) disagree
- 0% (N=0) strongly disagree

Based on this survey, it is clear that adult learners respond favorably to CAI. Thirty, out of thirty-one adults, indicated that they would rather work on the computer than use workbooks and teacher-made worksheets. A similar number of adults also indicated that instructional activities on the computer were not difficult or confusing to understand. Twenty-nine, out of thirty-one adults, stated that they would have liked spending more time on the computers, and twenty-six adult students indicated that computers were better at providing assistance in the basic skill areas than merely providing games.

Each adult student was briefy interviewed and asked to express their opinions about CAI.

Interestingly, nine adult students used the words "fun" or "enjoyment" in their first sentence in describing their experiences with computers.

In six cases, adults used the words "it helps" or "it explains" in their initial statement about CAI. Several adults remarked that using the computer keyboard, rather than physically writing answers, was a highly enjoyable feature.

Adults were requested to indicate what aspects of CAI they did not enjoy. Eighteen adults did not feel there was anything about computers they did not like. The majority of problems which were cited by the other adults were related to problems in loading the cassette tape-driven computers.

Each adult was asked to describe the ideal ABE class period in terms of working on the computer and working directly with the teacher.

- 2 adults indicated that they would perfer to work 75% of the time on the computer and 25% with the instructor;
- 14 adults stated that they would perfer to work 50% of the time on computers and 50% with the instructor;
- 15 adults stated that they would perfer to work 25% of the time on computers and 75% with the instructor;
- no adults indicated that they would perfer working 100% of the time with either the computer or teacher.

Attitudes of Instructors Towards CAI:

Each instructor was asked to complete a brief questionnaire. Responses were anonymous.

The one point on which all four instructors agreed was their rating of CAI as an excellent motivator for adults. In respect to the quality of courseware, three instructors felt that the materials available were "good," and one instructor indicated that the courseware was "fair." The major advantage cited by the instructors of CAI was the opportunity to use computers to create smaller working groups for teachers.

Outcomes:

While attitudinal measures clearly demonstrated that adult learners in our ABE classes regarded computer aided instruction as a highly favorable activity the central question related to the effect of CAI on learning is difficult to answer. Controlling factors, or variables, in a field study of this nature is hard to arrange in order to isolate the effect of CAI.

First, although it was the intention of our project to examine the effect of CAI on the rate of learning, we had problems in defining what role CAI would have in our instructional program. Within the context of our report, we continually describe a type of evolutionary process. Our instructional program was subject to change based on the instructors' familiarity with the hardware and software. There will be a tremendous distinction in the quality of CAI based on the role the teacher will assume and the degree to which CAI is integrated into the instructional program.

Second, student attendance (mortality rate) was a major factor in predicting achievement. Without being able to control for absenteeism, the internal validity of results in terms of test score achievement is questionable.

Primarily due to these problems, it is inappropriate to state that ABE classes with CAI will demonstrate a certain academic gain over ABE classes without CAI. Comparison studies between groups would require a larger sample of ABE students and controlling or matching attendance rates of learners.

It was possible to compare attendance records of ABE students for classes offered in 1981-82 without CAI and classes offered in 1982-83 with CAI as a basic element in instruction. It was observed that ABE classes with CAI had an increase in general attendance. In 1981-82 the average student attended 92 hours of instruction while in 1982-83 the average student attended 98.5 hours of instruction. This represents an increase of 9 percent in overall attendance.

> It should be noted that attendance in Northern Schuylkill County is influenced by the lack of public transportation and road conditions through the winter months.

What must be considered as a positive outcome of CAI is the opportunity to allow adults to become more active in their own instructional program. In our section on Unanticipated Positive Outcomes, we reported our observation that adults demonstrated a basic interest in operating computers and selecting their own courseware. These activities were highly social experiences. Often adults worked in small teams in order to understand how to run a particular program or in completing the work presented on a program. Using workbooks or teacher developed worksheets, students tended to view their work more privately. On computers, adults were more likely to assist other students complete an assignment. The possibility that the computer could be an effective means in promoting peer teaching is an important development which should be further explored.

At the 5-8 instructional level, adults were more apt to express their interest in the type of program which they felt would be interesting and appropriate. Adults at the 1-4 instructional level were less likely to express their own preference in terms of courseware selection; however, given the opportunity to determine the number and degree of difficulty of problems (menu selection) on a particular program, adult students at this level did exercise their perference.

Comments:

Using CAI in Adult Basic Education presents a unique challenge. Generally, ABE classes are scheduled for a duration of 200 instructional hours; this may result in an arrangement where three or two class sessions are offered each week with each class period ranging in length from two to three hours. Time available for assisting adult learners reach certain educational goals is limited and educators working with adult students must be highly sensitive in using this available time wisely.

In educational settings much of the information presented in relation to the implementation of CAI has been in connection with projects conducted in regular classroom instruction, elementary and secondary educational programs. However, in these settings the instructor might have a total of 1,200 instructional hours with their students, over a 180 day period, in order to meet certain instructional/ social purposes. Simply, in a regular classroom setting, there is more time available for the teacher to experiment and explore the practicality of using CAI without risk to the total educational program. The mere task of preparing computer stations for use with students might require 15-20 minutes daily. In a regular classroom setting, this time would represent prehaps 4% of the total instructional time; however, the same time required to prepare computer stations for adult evening classes could represent 14% of the available instructional class time.

The effective use of CAI is based on the principle of substitution. The teacher substitutes CAI activities for less productive/beneficial activities. The more limited the total time available for instruction, the more difficult it becomes to effectively substitute activities.

Based on our experiences related to this project, there are several points which should be considered by adult educators prior to initiating CAI.

The funding level for most ABE programs would not permit the independent aquisition of computer hardware. We have discussed the availability of computer hardware in schools and suggested that it is increasingly likely that ABE classes are, or will be, offered in educational facilities which will have a sufficient number of computers available for use in evening programs. It is not necessary for administrators in ABE programs to consider direct purchase of computer equipment, rather coordination of resources. However, in addition to the availability of computer hardware, we have observed that the degree of experience which teachers have with CAI will be significant in determining the quality of the entire program. Computer aided instruction cannot be evaluated as an independent element; it is necessary to understand how the role of the teacher is affected when computers are used as a part of the total instructional system. The experience of the teacher with CAI appears to be a factor in the teacher maintaining an active role (rather than passively serving as an auxilary support for computer courseware) and in integrating CAI into the fiber of an ongoing instructional program. Coordination of resources for CAI should involve an assessment of the teacher's capabilities and interest in using computers.

Courseware development is progressing at an unbelievable rate. Programs available in our Computer Resource Center perhaps represent what may be typical in the majority of schools for CAI. Using the courseware in our library, we found it difficult to present non-traditional instructional strategies via CAI, such as: simulations, problem solving, and educational gaming. Tutorial programs were not sufficient to present instructional concepts without additional interaction with the regular teaching staff. Although "drill and practice" programs were well-received by adult students and instructors, it represents a limited application of CAI. Using CAI for "drill and practice" was not observed to be statistically significant in improving learning. Student attendance was the most reliable predictor of student achievement; however, classes with CAI seems to have had a modest effect on overall attendance. On attitudinal measures, adults responded very favorably towards CAI as a means of presenting CAI. Justification of CAI based on these facts alone is difficult. A better argument for initiating CAI for "drill and practice" with adult learners might rest on the potential for using this instructional strategy for presenting a series of activities which adults could directly manage. We observed that adults will exercise reasonable discretion in the selection of courseware which they wish to use. In fact, the positive perception of CAI maintained by adults may be more a factor of the opportunity to make certain educational decisions for themselves on the computer rather than the quality of CAI courseware for "drill and practice."

Although our actual sample of adult students was too small to generate valid statistical data, it appeared that the more negative an adult student's perception of public education, the more likely the student would respond favorably to CAI as a means of presenting drill exercises. This is consistent with the view held by other educators who observed CAI.

> A feature of computer assisted instruction that appeals to reluctant learners is the sense of control that they get during the learning experience. In conventional instruction, the teacher controls what is presented and the rate that is appears. But with computer assisted instruction, the learner is in charge. Tolor (1969) found that measurements of students' "internal locus of control" increased after only eight weeks of computer tutorial experience. (Joiner et al, 1981, p.127).

Based on our experience, we recommend that "drill and practice" through CAI be structured to allow a high degree of student control. This would involve training adult learners in the basic operation of computers and procedures for selection of courseware.relative to their educational needs. Emphasizing this type of activity would also have the advantage of freeing the instructor from time consuming tasks associated with CAI. Using volunteer aides and peer teaching to assist in this area should also be considered.

Using CAI within a 200 hour ABE instructional program will always present certain problems related to the allocation of teacher time. Consideration should be given in exploring the use of computer labs in addition to the 200 hour ABE program. For example, computer labs might be made available for adults before or after regularly scheduled class periods. With the assistance of volunteer aides (using ABE students who have completed their instructional program), adults could be assisted in using computers independent of direct teacher supervision. In cases where two ABE classes are offered simultaneously, the class time for each section could be staggered in order that one ABE instructor would be able to indirectly supervise the computer lab for additional student instructional activities. To a limited degree this was attemtped in our project. We found that adults were capable of behaving in a responsible manner without direct teacher supervision and securing volunteer aides was not difficult. In fact, we utilized the services of a former ABE student to assist the adults in the computer lab. In response to the aid offered by the volunteer, we allowed that person the opportunity to use one of the computers to learn programming. This provide a resonable incentive to serve as an aide in the computer center. Many of the problems associated with integrating CAI into a traditional ABE instructional format would be eliminated by using CAI as a supplement to the 200 hours of ABE instruction.

CAI effectively integrated can allow a greater degree of individualiztion. The effort to manage and structure small group learning activities becomes increasingly important as the homogeneity of the class decreases. ABE classes with a diverse student population in terms of academic needs may find it more beneficial to initiate CAI. Attention should be made in extending class periods if CAI is used as a basic element in the instructional program since this would reduce the total percentage of instructional time required for the teacher to prepare various computer stations for instruction. Also, CAI provides the type activities which provides sufficient divergence from regular classroom activities to allow interest and attention remain high during longer class periods.

Finally, administrators should be sensitive to the attitudes and level of experience teachers have in respect to computer aided instruction. It is important that teachers see for themselves the advantages of using computers. Imposing on teachers a ridget code of behavior for implementing CAI will likely result in resistance. CAI requires the willingness of the teacher to expend additional energy and time in mastering aspects of this new technology. The motivation for this effort, at least to some degree, must be from the teachers themselves. Allowing teachers some input into decisions related to CAI will enhance acceptance and understanding of this medium for instruction.

In this project the administrators stressed certain goals for instruction. Basically, teachers were asked how CAI could be used to better reallocate their time. Teachers were never told to follow a certain format. Rather, teachers were encouraged to explore different avenues for instruction with the computer. Throughout the project acceptance of CAI by the teachers was high. Most importantly, teachers continually searched for procedures which capitalized on the elements of CAI which they perceived as advantageous in the instruction of adult learners.

Microcomputer Courseware:

Providing invaluable assistance to the Shenandoah Valley School District and Intermediate Unit, No.29, in surveying courseware for application in student preparation for the GED (High School Equivalency Examination) was Jonathan Kantrowitz, Chief Executive Officer, Queue, Inc. In 1980 Queue published the first catalogue of educational software. At that time it contained a listing of fifty programs from eight different publishers. Currently, the Queue Catalogue, in its 17th edition, contains approximately three-thousand programs, representing nearly three-hundred publishers. In order to provide educators with recent developments in educational courseware, Mr. Kantrowitz initiated a monthly newsletter, Microcomputers in Education (MIE). In 1980 MIE became only the second publication to serve educators in understanding and using computer hardware and software for instruction. (The Computer Teacher was the first publication).

Through Mr. Kantrowitz's effort one GED test currently available on the market was identified. In addition, Mr. Kantrowitz has compiled a recommened listing of materials which might prove useful in utilizing the microcomputer to help prepare learners for the GED examination. Also, a listing of materials for Adult Basic Education has been developed. These programs are not reported as the best possible computer software or courseware on the market; a complete research and evaluation of all microcomputer programs is not feasible. However, these reported programs should provide some guidance to educators in selecting materials for adult learners.

It should be noted that the Shenandoah Valley School District has relied on the expertise of Mr. Kantrowitz previously and found his judgment in respect to courseware to be excellent.

Mr. Kantrowitz has worked in public education and adult education. He is a graduate of Brown University and Harvard Law School. In addition to his work at Queue and Microcomputers in Education, he is an Adjunct Professor of Law at the University of Bridgeport.

For further information in respect to any reported courseware, educators may directlt contact Queue, Inc. 5 Chapel Hill Drive, Fairfield, CT 06432 (phone: 800-232-2224).

Identification of Courseware for the GED (High School Equivalency Exam)

Currently, the microcomputer is being widely used as a means of assisting learners prepare for various examinations. There are now well over a dozen programs on the market to prepare students for the Scholastic Aptitude Test, in addition tests are available for the PSAT, ACT, GRE, LSAT, GMAT, and English, French, and Spanish Achievement Tests. There is even software available to prepare for the Multistate Bar Exam.

However, after a diligent search involving the full resources of Queue, only one program designed for the GED was identified. This program was only available for the TRS-80, although conversion to the Apple was reported as under way by the company.

GED-100 by Educational Software and Marketing
Outerpark Drive
Suite 309
Springfield, IL 62704

This program includes 16 disks, 132 page student manual, and 26 page teacher manual. It claims to provide diagnostic analysis, remediation, testing, reinforcement, and prescriptions for additional assignments. The cost is $1,275, however, in order for the program to be compatible for a networking system, the cost is $5,200.

Repeated efforts by Mr. Kantrowitz to secure additional information about this series or preview parts of the program has not been successful A six page brochure was submitted to Mr. Kantrowitz, but the information presented failed to discuss specific details. In fact, Mr. Kantrowitz described the brochure as extremely vague.

Shenandoah Valley and Intermediate Unit, No.29 working independently from Mr. Kantrowitz failed to identify any GED type testing program available for microcomputers. However, two companies were found who reported that they were in the process of developing courseware for the GED. Although one company stated they were just in the planning stages, one producer indicated that their GED program would be soon available for marketing. Repeated efforts to secure information related to their program failed. No description, or even proposed cost, was revealed by the producer.

An effort to locally develop programming for microcomputers which can assess or predict outcomes for the High School Equivalency Exam presents tremendous problems. Each state will establish its own criteria for passage; thus, national norms are not available for successful completion of the five examination sections. Although the multiple choice format used to assess information in the various academic areas is not difficult to design, the reading passages used to evaluate the learner's reading comprehension (social studies/science) is hard to program for microcomputers.

It may be possible for local educational agencies to acquire an authoring system which allows programming compatible to the requirements of the GED exam. An effort was made by the Shenandoah Valley School District and Intermediate Unit, No.29, to attempt to use an authoring program which could be used to assess the ability of adult learners to complete aspect of the GED. (*This effort was evaluated by local personnel as the most practical. To develop an original program design would have been extremely costly--lacking national norms, its value would have been less certain in other states Distribution would have been difficult, if not impossible).

The Exam Builder, by A.U. Software; Box 597, Colleyville, TX (817) 267-5236 offers some possibilities to local educational agencies which wish to develop some testing instrument to assess the potential of adult learners for the GED on microcomputers. The Exam Builder is a test generation and storage system. The program menu allows educators ease in designing complete tests, editing previously designed tests by adding new questions or deleting questions, and obtaining a hard-copy of all stored test questions. The Exam Builder will maintain five subject files for storage of questions; this corresponds to the testing areas for the GED. Any of the five files can be easily accessed by either the instructor or student. The Exam Builder can generate a test of up to 150 questions in length from any of the five files. Questions are selected randomly from the file constructed by the instructor; therefore, once created, a subject file would adequately serve as a pre-and post-test indicator. The instructor can write as many as 200 questions for any one subject file. Students can be assigned up to 150 questions--if the instructor wished, a student could be given a test of fifty questions for example. The program will select at random fifty questions from the teacher designed file of 200 questions. If desired, the instructor could include an answer key which would be presented to the learner when a certain pass word is printed. One major limitation is that a question can not exceed 254 characters in each question. This program is designed for both the TRS-80 and Apple.

If the Test Builder is used on the Apple, the program will not accept inputs which contains commas or semicolons. This will limit the capacity to assess sentence structure. The major problem with this program is connected with evaluating the student's reading level. The GED uses long passages to test comprehension; this is not possible with the 254 character limitation per question. However, many aspects of mathematics, language arts, and some elements of social studies, science, and reading comprehension can be evaluated. Despite these limitations, the Exam Builder can be useful to ABE and GED instructors as a testing tool. The cost of this program is approximately $125.

Mr. Kantrowitz recommends the High School Math Competency Skill from Microcomputer Workshops (description to follow) as a possible assessment tool for predicting GED compentency in Mathematics.

Based on an extensive survey, a compilation has been developed by Mr. Kantrowitz, and the staff at MIE, which describes programs which may be appropriate for GED preparation, arranged by various subject areas. The selected programs were listed based on their perceived appropriateness for adult learners--avoidance of graphics, animations, gaming formats more appropriate for elementary and secondary students. In addition, a listing of courseware for ABE programming has been included.

TEST 1 - Writing Skills

Spelling, Punctuation and Capitalization (25%)

Spelling

1. WHOLE BRAIN SPELLING - GENERAL - SubLOGIC. Apple disk. $34.95.

2. SPELLING MACHINE - Southwest Ed Psych Services. 700 words and sentences encompassing 85% of words most frequently used by elementary school children. Apple disk $49.95.

3. SPELLING IN CONTEXT - Bertamax. Learning to spell a word in the context of a sentence helps to provide meaning to the word. In this program, each word is flashed on the screen for a brief time. The period of time is chosen by the user. Then the word disappears and a sentence is displayed. The sentence has a blank where the letters of the word will appear as the user types them. If the word is correct, a positive message is given. If the word is misspelled, one of several corrective messages, like "TRY AGAIN" is given. If a second error is made, the correct spelling of the word is given. The user is required to spell the word correctly before the next word is presented. Each misspelled word is recorded by the computer. If the user scores less than 90 percent correct on the lesson, the misspelled words are reviewed at the end of the regular lesson. Prices for:

	Atari, TRS-80 cassettes	Apple, Atari, TRS-80 disks
Grade level 5:	$ 89.50	$ 59.50
Grade level 6:	$ 89.50	$ 69.50
Grade level 7:	$ 89.50	$ 79.50
Grade level 8:	$ 119.50	$ 89.50

4. SPELLING SERIES (Grade 5 and 6) - Micro Ed. Each grade level consists of 36 lessons in seven programs, with 10 words in each lesson. Apple, Atari, PET, 32K TRS-80 Color & Model III disks, COM. 64, VIC-20 5K, TI 99/4 cassette or disk $99.90.

*5. SPELLING BUILDER - Program Design Inc. Master the difficult words. Is it "supersede" or "supercede", "combustable" or "combustible"? Voice narration accompanies the programs, which offer both a speaking drill and a method for approaching difficult words. Final test of 320 words. Atari Cassette $19.95. Atari, Apple Disk $26.95.

6. FUNDAMENTAL SPELLING WORDS IN CONTEXT - Random House. Spelling drill and practice for students in grades 1-8. Words from basal spelling textbooks, The American Heritage Word Frequency Book, lists of spelling demons, and other lists of frequently used words. 308 lessons covering 5,280 words. Separate lessons for each grade level from 1 through 8. Each lesson centers on a particular spelling skill and presents spelling in context, rather than spelling words in isolation. Misspelled words are remembered by the computer and presented for review at the end of each lesson. TRS-80 cassette; Apple, TRS-80 disks $225.00.

7. SPELLING DEMONS - L.I.F.E. Software. The Spelling Demons program consists of 9,600 words in 100-word units. It is available on two disks, each with a teacher management system. A word editing program allows teachers to change any or all of the 9,600 words. The words vary from first grade to U.S. National Spelling Bee Level. Apple disk $250.00.

8. SPELBOUND - Blythe Valley. Comprehensive system to support any spelling program. Parents can use the package to help their children at home. 13 systems present word scrambles, mazes, games and spelling correction. Ages 6 to adult. IBM PC disk $79.95.

9. SPELLING - Academic Hallmarks. 400 High School Questions. Apple Disk. $27.00.

10. STEPS TO SPELLING BREAKTHROUGH 2 - EMC. Words misspelled by 50% of students in grades 5 and 6. Apple, TRS-80 disks $96.00, with back-up $136.00, 8 audio cassettes with Teacher's Guide $92.00, student workbooks $2.25 each.

11. STEPS TO SPELLING BREAKTHROUGH 3 - EMC. Words misspelled by 50% of students in grades 7 and 8. 2 Apple, TRS-80 disks $96.00, with back-up $136.00, 8 audio cassettes with teacher's guide $92.00, student workbooks $2.25 each.

*12. SPELLING BREAKTHROUGH - EMC. Words often misspelled by high ability students. 2 Apple, TRS-80 disks $96.00, with back-up $136.00, 18 audio cassettes with Teacher's guide $159.00.

*13. PRACTICAL SPELLING - Intellectual Software. Excellent tutorial. Contains suggestions for improvement, definitions of terms, basic spelling rules, forming plurals of nouns, forming possessives, forming contractions, misspelling caused by suffixes, and one hundred spelling demons. 2 Apple disks $39.95, with classroom management system, $59.95.

Punctuation

1. FUNDAMENTAL PUNCTUATION PRACTICE - Random House. More than 30 lessons in punctuation skills: periods; sentences; abbreviations and initials; question marks; commas; dates, addresses, quotes, conjunctions, subordinate clauses, series, interrupters, pauses; exclamation marks; apostrophes; quotation marks; semicolons; parenthesis. TRS-80 cassette; Apple, TRS-80 disk $150.00.

2. PUNCTUATION & CAPITALIZATION - Bertamax. Enables students to edit sentences to correct errors in punctuation and capitalization. No typing skill is required. Changes are made by selection changes from a menu of choices. Covers skills include in most standardized tests. Features: carefully graded sequence of skills, 10 lessons per grade level,grades 4 to 8. 16K TRS-80 Model III disk $39.50 per grade level,cassettes $45.50 per grade level.

3. PUNCTUATION SKILLS: Commas - Milton Bradley. Introductory elements, items in a series, interrupting elements, independent clauses, dates, addresses, letters and titles. Apple disk $49.95.

4. PUNCTUATION SKILLS: Endmarks, Semicolon, Colon - Milton Bradley. Period, question mark, exclamation point, semi-colon (2 skills), and colon. Apple disk $49.95.

5. PUNCTUATION SERIES - Micro Ed. 8 programs - Drill and practice using a standarized test format. The computer randomly selects and presents a problem sentence. The student must identify where (if at all) a mistake in punctuation occurs. As the learner responds, the computer not only says whether the answer was right or wrong, but sets forth the applicable rule for the correction (if any). Each lesson covers from two to seven rules of punctuation. Apple, Atari, PET, VIC-20 8K, TI 99/4 Extended Basic, 32K, TRS 80 Color & Model III disks, COM. 64 cassettes or disk $56.00.

6. PUNCTUATION - THE SENTENCE ROAD MAP - Media Materials. After reviewing simple ending punctuation, students work with capitalization, abbreviations, commas, and apostrophes. Helpful examples also advise on avoiding run-on sentences and sentence fragments. Duplicating masters, instructor's guide. Apple, TRS-80 Model III disk $39.95.

7. PUNCTUATION I - Educational Activities. (The Period, Question Mark and Exclamation Point) Color, graphics, animation and sound. A letter to the student teaches and reinforces basic punctuation. An interactive tutorial method is used to immediately involve the student with the lesson. As the period, question mark and exclamation point are introduced, the student is also given drill work consisting of inserting the correct punctuation at the end of sentences. Each mark is given an identifying sound which is heard only when the mark is correctly used by the student and provides an instant reward for work done correctly. The program branches back to instruction when the student makes an error. Additional drill material is provided for students who make more than four errors in the first twenty sentences to be punctuated. Includes reproducible activity masters. Apple, PET, TRS-80, Atari disk $59.00

8. PUNCTUATION II - Educational Activities. (The Comma) Similiar to above. Apple, PET, TRS-80, Atari disk $59.00.

9. PUNCTUATION REVIEW - Intellectual Software. Tutorial and drill on open and closed punctuation, the period, the comma, the semicolon, the colon, parenthesis, the dash, brackets, the question mark, the exclamation mark, quotation mark, single quotation marks, the apostrophe. Over 200 exercises. Each answer explained. Apple disk $19.95.

10. IMPROVING YOUR PUNCTUATION - Random House - BLS. Reading level 8-9. Content level 9+. A Comprehensive collection of 17 Apple 48K disks on all aspects of punctuation, including end punctuation, semi-colon, colon, dash, quotation marks, parenthesis, brackets, underlining, italics, apostrophe and hypen - Apple disks. $867.00.

11. COMMAS - Micro Power and Light. Program states the rule related to 12 comma uses of the comma and then provides exercises. The rules covered deal with items in a series; more than one adjective; nouns in a direct address; titles and degrees; the adverb "to"; interrupting elements; successive independent clauses; indroductory clauses and phrases; nonessential modifiers; explanatory words and phrases; contrasts and alternatives; long phrases of identification.

Rules are presented in the form of a menu. The student can cause the program to present as many (or as few) drill and practice exercises as desired - being able to stop or to return to the menu after working each exercise. In addition, while working the exercises, the student can ask to see the rule stated again - to reinforce his or her understanding on the spot! Apple disk $29.95.

Capitalization

1. CAPITALIZATION - Hartley. This two-disk system provides for practice and testing on the application of the major rules of capitalization. The practice disk presents a rule followed by up to 20 randomly presented sentences which provide practice on the rule. The test disk measures the student's ability to correctly apply rules of capitalization. It may be used as a pre-test or post-test. The management system gives immediate feedback to the student and stores records of each student's test results for later review by the teacher. Results may be printed or viewed on the screen. The teacher has the ability to modify or add new materials to either disk. The lessons, using upper/lower case letters, are appropriate for levels 3-8. Apple disk $49.95.

2. CAPITALIZATION - Educational Activities. Animated, color graphics and sound. Covers capitalization in letter headings, addresses, quotations and names. It also illustrates the use of capital letters with the end punctuation marks covered in PUNCTUATION I. The format is continuously interactive throughout both the tutorial and drill sections. Several different types of drills are used to maintain student interest. Apple, Atari, PET, TRS-80 disk $59.00.

3. CAPITALIZATION 5-6 Random House - BLS. 4 disks $216.00.

4. CAPITALIZATION 7-8 - Random House - BLS. 6 Apple disks $324.00.

5. MECHANICS - Right on Programs. Six programs on End Marks, Commas, Quotations, and three on Capitalization. Apple, PET disks and cassettes $18.00, all 6 for $90.00.

6. CAPITALIZATION PLUS - Microcomputer workshops. Covers all capitalization rules. After a diagnostic test, the program branches to an appropriate level of difficulty. Each rule is carefully explained and illustrated. Error analysis. Apple disk $39.95.

Sentence Structure, (15%)
Diction and Style (15%)
and
Logic and Organization (15%)

*1. IMPROVING SENTENCE STRUCTURE - Random House - BLS. Reading Level 8-9, Content Level 9+. Six disks on PARALLEL STRUCTURE; SHIFTS IN PERSON & SUBJECTS; SHIFTS IN TENSE & SHIFTS IN MOOD; SHIFTS IN VOICE. Apple $60.00 each, all 5 for $270.00

*2. IMPROVING YOUR STYLE - Random House - BLS. TECHNIQUES & SUBORDINATION OF IDEAS; SIMPLE, COMPLEX AND COMPOUND SENTENCES; VARIETY IN WORD ORDER AND SENTENCE LENGTH. Apple $60.00 each, all 4 for $216.00.

3. WORDY - COMPress. Wordy is a three diskette package which contains writing assistance lessons with imaginative graphics. The do's and don'ts of composition are taught through examples and quizzes. Topics covered are circumlocution, vague expressions, redundancy, "it is" constructions, weakening intensifiers, pretentious diction, elaborate constructions and unnecessary "is" and "are" forms. Apple disk $100.00.

4. PRACTICAL COMPOSITION I: MAKING WORDS WORK - Intellectual Software. Tutorial on choosing the right word (exactness), denotation and connotation, emotional an unemotional words, specific and general words, little vs. big words, avoiding foreign words, avoiding slang words, using idioms correctly, avoiding trite words, avoiding over-used business phrases, and summary. Apple disk $29.95, with classroom management system $39.95.

*5. PRACTICAL COMPOSITION II: LOGICAL, CLEAR SENTENCES - Intellectual Software. Tutorial on sentence sense, co-ordination and subordination, sentence length. Apple disks $29.95, with classroom management system $39.95.

*6. PRACTICAL COMPOSITION III: EFFECTIVE ORGANIZATION - Intellectual Software. Incorrect omissions, comparisons, ineffective and awkward sentences, parallel construction, sentence variety, and summary. Apple disk $29.95 with classroom management system $39.95.

7. PRACTICAL COMPOSITION IV: SELECTING THE BEST APPROACH - Intellectual Software. Tutorial on description, narration, argumentation, exposition, blending the four types, personal and impersonal style, the "you" attitude, introductions and conclusions, first draft and revision, and developing an effective style. Apple disk $29.95, with classroom management system $39.95.

8. PRACTICAL COMPOSITION PACKAGE - Intellectual Software. All four of the above. 5 Apple disks $125.00, with classroom management system $165.00.

9. SENTENCE STRUCTURE ERRORS - Right on Programs. Five programs on, FRAGMENTS A AND B, MISPLACED MODIFIERS, RUN ON SENTENCES A, AND RUN ON SENTENCES B. Apple, PET disks and cassettes $18.00 each, all 5 for $90.00.

10. IMPROVING WRITING STYLE - Right On Programs. Five programs on COORDINATION A, COORDINATION B, FAULTY COORDINATION, SUBORDINATION A, AND SUBORDINATIONS B. Apple, PET disks and cassettes $18.00 each, all 5 for $90.00.

11. IMPROVING WRITING STYLE-ADVANCED - Right On Programs. Five programs on PARALLEL STRUCTURE A, PARALLEL STRUCTURE B, SENTENCE BEGINNINGS A, SENTENCE BEGINNINGS B, AND EXCESS WORDS. Apple, PET disks and cassettes $18.00 each, all 5 for $90.00.

12. GLOSSARY OF USAGE - Right On Programs. Five programs on Usage. Apple, PET, disks and cassettes $18.00 each, all five for $90.00.

13. PROOF READER - E. David and Associates. English language exercises program concerning grammar, punctuation, and spelling errors in a prose sample. Students are asked to identify each error in the sample and provide a correct text. The computer keeps track of all remaining errors in the text,judges the student's responses, and inserts the student's corrections into the text as they are made. Texts to be corrected are constructed by the teacher. Sample text and instructions included. TRS-80 Model III 48K disk $29.95.

14. COLLEGE ENGLISH II - COMPOSITION - Intellectual Software. Five tutorials and drills on Managing the Sentence, Managing the Paragraph, Managing Words, Managing Punctuation, and Managing the Whole Composition. 5 Apple, IBM PC, TRS-80, Comm. 64 disks $34.95 each,all 5 for $165.00. Available October, 1983.

Grammar and Usage (30%)

1. PARTS OF SPEECH I - Intellectual Software. Tutorial and drill on nouns, pronouns, verbs and verb phrases. Over 200 exercises, automtically scored. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

2. PARTS OF SPEECH II - Intellectual Software. Tutorial and drill on adjectives, adverbs, prepositions, conjunctions and interjections. Over 200 exercises, automatically scored. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

3. SENTENCES - Intellectual Software. Tutorial and drill on subject and predicate, complete subject and complete predicate, simple subject and simple predicate, compoung subject and compound predicate, sentence fragments, diagramming the subject and predicate, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

4. SENTENCE PATTERNS - Intellectual Software. Tutorial and drill on kinds of sentences, inverted order, interrogative sentence patterns, imperative and exclamatory sentence patterns sentences that begin with "There", diagramming the subject and predicate, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

5. NOUNS - Intellectual Software. Tutorial and drill on kinds of nouns, capitalization of proper nouns, special uses of capital letters, plural forms of nouns, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

6. PRONOUNS - Intellectual Software. Tutorial and drill on kinds of pronouns, compound personal pronouns, interrogative pronouns, demonstrative pronouns, indefinite pronouns, relative pronouns, pronouns used as adjectives, possessive forms of pronouns, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

7. PRONOUNS AND ANTECEDENTS - Intellectual Software. Tutorial and drill on agreement of pronoun and antecedent in gender, gender and number of indefinite pronouns, agreement of pronoun with a compound antecedent, agreement of pronoun with collective nouns, agreement of pronoun and antecedent in person, vague antecedents, adjective - pronoun agreement, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

8. COMPLEMENTS OF VERBS - Intellectual Software. Tutorial and drill on the direct object, transitive and intransitive verbs, the indirect complements of linking verbs, diagramming complements of linking verbs, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

9. CASE OF NOUNS AND PRONOUNS - Intellectual Software. Tutorial and drill on case of nouns, nominative case, objective case, case of pronouns, nominative case of pronouns, objective case of pronouns, possessive case of nouns, use of the possessive-special forms, possessive case of pronouns, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

10. MODIFIERS: ADJECTIVES - Intellectual Software. Tutorial and drill on use of adjectives, "overworked" adjectives, kinds of adjectives, predicate adjectives, nouns used as adjectives, comparison of adjectives, irregular comparison of adjectives not compared, diagramming the adjective modifier, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

11. MODIFIERS: ADVERBS - Intellectual Software. Tutorial and drill on forms of adverbs, interrogative adverbs, yes, no, and not, adverbs of degree, nouns used as adverbs, comparison of adverbs, irregular comparison of adverbs, diagramming adverbs, correct use of adjectives and adverbs, special cases, the double negative, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

12. PRINCIPAL PARTS OF VERBS - Intellectual Software. Tutorial and drill on basic forms of verbs, regular and irregular verbs, verbs added to the language, troublesome verbs, principal parts of troublesome verbs, six confusing verbs: "lie" and "lay" "sit" and "set", "rise" and "raise", summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

13. COMPREHENSIVE GRAMMAR REVIEW I - Intellectual Software. Over 200 exercises on identifying the parts of speech, finding the subject and the predicate, identifying sentence fragments, identifying the kinds of sentences, making the verb and the subject agree, distinguishing between action and linking verbs, using verbs correctly, using pronouns correctly, using adjectives and adverbs correctly, forming possessives correctly, using capital letters correctly, identifying the complements of verbs, forming the plurals of nouns correctly, using the correct forms for the plural, correct usage. Hard cover textbook. Apple disk $34.95, with classroom management system $44.95.

*14. PRACTICAL GRAMMAR PART I - Intellectual Software. All of the above including textbook, 13 Apple disks, $189.00, with classroom management system $289.00.

15. THE TENSES OF VERBS - Intellectual Software. Tutorial and drill on the six tenses, the simple tenses, the perfect tenses, the verb "to be", progressive forms of verbs, emphatic forms of the verb, the use of "shall" and "will" -- "should" and "would", mixed tenses, the "of" error, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

16. VERBS: VOICE AND MOOD - Intellectual Software. Tutorial and drill on active and passive voice, how the passive voice is formed, six tenses of the verb "call" -- passive voice, six tenses of the verb "know" passive voice, when to use the passive voice, mood of verbs, subjunctive forms of verb "to be," uses of the subordinate mood, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

17. AGREEMENT OF SUBJECT AND VERB - Intellectual Software. Tutorial and drill on agreement in person and number, agreement of verb with compound subject, agreement of verb with collective nouns, intervening phrases, agreement of subject with contractions, agreement of verb with indefinite pronouns, special cases of agreement, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

18. PREPOSITIONAL PHRASES - Intellectual Software. Tutorial and drill on adjective phrases, commonly used prepositions, adverbial phrases, compound or phrasal prepositions, pronouns used as objects of prepositions, diagramming the prepositional phrase, the correct use of prepositions, position of the preposition, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system, $29.95.

19. THE COMPOUND SENTENCE - Intellectual Software. Tutorial and drill on kinds of clauses, the simple sentence, the compound sentence, co-ordinate conjunctions, use of the semicolon in the compound sentence, the comma fault, the run-on sentence, transitional words, diagramming the compound sentence, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system, $29.95.

20. ADJECTIVE CLAUSES - Intellectual Software. Tutorial and drill on the complex sentence, kinds of subordinate clauses, adjective clauses, adjective clauses introduced by relative adverbs, "who" and "whom" in subordinate clause, restrictive and nonrestrictive clauses, diagramming the complex sentence, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

21. ADVERBIAL CLUASES - Intellectual Software. Tutorial and drill on subordinate conjunctions, words used as subordinate conjunctions kinds of adverbial clauses, clauses of degree, position of the adverbial clause, clauses of comparison, "as--as" and "not so--as" in comparisons, incorrect use of "like" in clauses, diagramming the adverbial clause, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

22. NOUN CLAUSES - Intellectual Software. Tutorial and drill on function of the noun clause, omission of the connecting word, the noun clause used as an appositive, the noun clause and the introductory, "it", words that introduce noun clauses, diagramming the noun clause, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system, $29.95.

23. PARTICIPLES - Intellectual Software. Tutorial and drill on the nature of verbals, forms of the participle, the participial phrase, modifiers of participles, complements of participles, participles used in independent constructions, dangling participles, misplaced modifiers, participles used in verb phrase, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

24. GERUNDS - Intellectual Software. Tutorial and drill on nature of the gerund, the gerund phrase, complements of gerunds, adverbial modifiers of gerunds, adjective modifiers of gerunds, the possessive case before the gerund, the dangling gerund, diagramming the gerund, diagramming the gerund phrase, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

25. INFINITIVES - Intellectual Software. Tutorial and drill on nature of the infinitive, uses of the infinitive, infinitives used as adjectives, infinitives used as adverbs, complements of infinitives, modifiers of infinitives, the infinitive phrase, the omission of the sign "to", summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system, $29.95.

26. PROBLEMS WITH INFINITIVES - Intellectual Software. Tutorial and drill on the infinitive clause, verb "to be" in an infinitive clause, the split infinitive, special uses of the infinitive, the three-sided character of the infinitive, diagramming infinitives, summary. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system $29.95.

27. PUNCTUATION REVIEW - Intellectual Software. Tutorial and drill on open and closed punctuation, the period, the comma, the semicolon, the colon, parentheses, the dash, brackets, the question mark, the exclamation mark, quotation marks, the apostrophe. Over 200 exercises. Each answer explained. Apple disk $19.95, with classroom management system, $29.95.

28. COMPREHENSIVE REVIEW PART II - Intellectual Software. Over 200 exercises on parts of speech, subject and predicate, complements of verbs, kinds of sentences, verb forms, comparison of adjectives and adverbs, agreement of subject and verb, agreement of pronoun with antecedent, identifying phrases, correct case of pronouns, subordinate clauses, identifying participles, gerunds, and infinitives, plurals of nouns, capital letters, correct usage. Hard cover text $34.95, with classroom management system $44.95.

*29. PRACTICAL GRAMMAR II - Intellectual Software. All fourteen of the above plus hard cover text. 14 Apple disks $914.94, with classroom management system $294.95.

30. SUBJECT-VERB AGREEMENT + COMPOUND SUBJECTS - Random House - BLS. Apple disk. $60.00.

31. SUBJECT-VERB AGREEMENT IN SPECIAL CASES - Random House - BLS. Apple disk. $60.00

32. PRONOUN + UNCLEAR REFERENCE - Random House - BLS. Apple disk. $60.00.

33. AGREEMENT AND IMPERSONAL PRONOUNS - Random House - BLS. Apple disk. $60.00.

34. DANGLING VERB PHRASES - Random House - BLS. Apple disk $60.00

35. MISPLACED PHRASES + PASSIVE VOICE - Random House - BLS. Apple disk $60.00

36. IMPROVING YOUR GRAMMAR - Random House - BLS. All 6 of the above $324.00.

*37. ENGLISH ACHIEVMENT I-V - Microcomputer Workshops. Designed as a grammar practice for the College Entrance Examination Board's English Composition Exam, this series of programs is also an excellent English grammar tutorial and review for high school students. Sentences containing errors are presented in batches of sixteen. When the student gives an answer, s/he is told whether the answer is correct or incorrect. In either case, the error involved and a correct rewrite with an explanation is given. The part of the sentence which is incorrect is highlighted. After each batch of sixteen sentences an analysis is given to indicate kinds of errors being made and approximate achievement score. The student may choose to continue with another batch of sentences, and the analysis is updated. Each program is the series presents a different format which appears on the CEEB's English Achievement Examination. The Apple, IBM PC, and TRS-80 disk versions contain over 200 sentences per disk (I-IV) and 150 on disk V. The PET verson contains from 32 to 45 sentences per program, depending on the format. Apple, IBM PC disk $39.95, set of five disks $175.00.PET cassette $20.00 each, PET 32K disk $24.95 each. TRS-80 Model III disk, available for English Achievement I only $39.95.

38. USAGE - Right On Programs. Five programs on Subject/Verb Agreement A, Subject/Verb Agreement B, Irregular Verbs, Agreement of Pronoun/Antecedent, and Using Adjectives/Adverbs Correctly. Apple, PET disks and cassettes $18.00 each, all 5 for $75.00.

*39. USAGE BONERS - Micro Ed. This drill and practice series focuses on common mistakes in usage, such as lack of agreement between subject and verb, double negatives, etc. For each problem, the computer not only states whether the student's response is right or wrong, but also shows how the mistake in English usage presented in the problem should be corrected. There are ten problems in each lesson. The problems are randomly sequenced. At the end of each lesson, the student's performance is summarized. The format employed is frequently used in standardized achievement tests. Additionally, in order to prevent the student from identifying a mistake because of the content of a given problem sentence, many of the problem sentences are identical in content except for a specific mistake in usage. 15 programs. Apple, Atari, 32K TRS-80 Color & Model III disks, VIC-20 5K cassettes; PET, Com. 64, dTI 99/4 Extended Basic cassettes or disks $99.00

40. WORD DEMONS - Micro Ed. Five programs on troublesome words (sit, set; lay, lie; etc.) and their proper use. PET, COM. 64 cassette or disk $39.75 Atari, only 2 programs $18.90.

41. LANGUAGE LAB DRILL KIT 2 - Bluestone. This covers regular verbs, irregular verbs, usages, tenses, confused words, subjects and predicates, types of sentences, punctuation, rules, definitions, drills, and includes a record sheet ditto master and 3 ring binder. Atari disk or cassette, 16K $25.00.

42. SUBJECT-VERB AGREEMENT PLUS - Microcomputer Workshops. Covers all subject-verb agreement rules. After a diagnostic test, the program branches to an appropriate level of difficulty. Each rule is carefully explained and illustrated. Error analysis. Apple disk $39.95.

43. COLLEGE ENGLISH I - GRAMMAR - Intellectual Software. Tutorials in drill and explanation form. Each wrong answer branches to detailed explanation. Disk 1: Sentence Sense and the Parts of Speech. Disk 2: Phrases, Clauses and Whole Sentences. Disk 3: Managing the Verb, Nouns, Pronouns and the Sentence. 3 Apple, IBM PC, TRS-80, Comm. 64 disks, $39.95 each, all 4 for $105.00. Available October, 1983.

TEST 2 - Social Studies

Economics (20%)

1. ECONOMICS: WHAT, HOW, AND FOR WHOM? - Focus Media. Five programs. 1. What is Economics? Interactive exercises and review questions help your students to learn about the meaning of economics and the concepts of "needs", "wants", and "factors of production." 2. Economics: Definitions and Laws. Beginning withthe LAW OF SCARCITY, your students to learn about the fundamental questions every economics system has to answer: production possibilities, opportunity costs, and supply & demand. Totally interactive through the use of exercises, questions, supply and demand curves, and production possibility charts and graphs. 3. Economic Systems: Traditional, Command, Market. Interactive models and exercises will allow your students to see how each of these systems deals with the basic questions for economics. For example, in examining the command economy, they will actually have a chance to determine the goals for a society and set up a plan for their achievement. 4. Capitalism, Communism and Socialism. After comparing the three dominant economic systems, your students will examine the following concepts within the framework of the three systems: use of capital goods, labor, planning, profit, and role of government. Graphs, models, and exercises are provided, including graphs of money flow and planning in each of the economies. Also Teacher's Class Demonstration. 4 Apple, TRS-80 disks $159.00.

2. ECONOMICS - Dorsett. Covers 16 areas: What is economics?; Pure capitalism - a theory; Mixed capitalism in the US.; Government: expenditures; Microeconomics: a company; The distribution of wealth; GNP, inflation and recession; Labor and unions; Public welfare and poverty; Theory of income/employment; Government and the economy; Money and banks; Money and growth; Problems of growth; Law of supply and demand; and Production costs. 8 Atari cassettes (Requires education system master cartridge); TRS-80 Model I or III cassettes $59.90.

3. MACROECONOMICS I - Intellectual Software. Includes: 1) The Nature of Economics, 2)National Income Accounting, and 3) Income Determination. Apple, IBM PC disk $34.95. Available December, 1983.

4. MACROECONOMICS II - Intellectual Software. Includes: 1) Fiscal Policy, 2) Monetary Policy, and 3) Inflation and Depression. Apple, IBM PC disk $34.95. Available December 1983.

5. MICROECONOMICS I - Intellectual Software. Includes: 1) Demand, Supply, and Equilibrium Price; 2) Theory of Consumer Demand; and 3) Theory of Production. Apple, IBM PC disk $34.95. Available December 1983.

6. MICROECONOMICS II - Intellectual Software. Includes: 1) Imperfect Competition: Monopoly and Oligopoly, and Factor Pricing: Wage Rates, Capital, Interest and Rents. Apple, IBM PC disk $34.95. Available December 1983.

American History (25%)

1. AMERICAN HISTORY #1 - Academic Hallmarks. 400 questions on Early Explorations, The Colonial Period, The American Revolution, The Confederation, 1789-1817, 1817-1853, Apple disk $27.00.

2. AMERICAN HISTORY #2 - Academic Hallmarks. 400 Questions on 1853-1861, Civil War, 1861-1877, 1877-1913, 1913-1933, 1933-1953, 1953-1969, 1969-1982. Apple disk $27.00.

3. AMERICAN HISTORY #3 - Academic Hallmarks. 400 Questions on Native American History, Old West History, American Military History, Famous Americans, Presidents. Apple disk $27.00.

4. THE U.S. CONSTITUTION: NATIONALISM AND FEDERALISM - Focus Media. Three parts: "The Development of the Constitution" introduces students to the nature of British colonial govenrment in 18th Century America, examines events leading up to the adoption of the Articles of Confederation by the Continental Congress, and analyzes the structure and powers of the government under the Articles; "the Creation of the Constitution" explains how the actual Constitution was written, the ideas on which it was based, the nature of the government it created, the conflict of thought between Alexander Hamilton and Thomas Jefferson which gave rise to the Federalist vs. Anti-Federalist confrontation, and analyzes the actual Constitution and the disposition of power for which it provided; "Testing Your Knowledge of the U.S. Constitution" tests the material presented in the previous parts. Apple, TRS-80 disks $159.00.

5. AMERICAN HISTORY - Educational Courseware. Quizzes on Colonial period, Presidents, Wars, National Expansion (statehood), and Court Decisions. Program is modifiable, so that you can create your own lessons. Apple disk $36.00.

6. U.S. HISTORY - Dorsett. 16 programs on 8 cassettes from Age of Exploration to Man Reaches the Moon. TRS-80, Atari cassettes $59.00.

7. SOCIAL STUDIES PACKAGE - Demi-Software. Three programs on U.S. Geography (study of state capitals), World Geography (national capitals), and U.S. History (U.S. Presidents). Three TRS-80, Atari 16K cassettes $29.85.

Geography (15%)

1. AFRICA - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

2. ASIA - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

3. EUROPE - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

4. CENTRAL AMERICA/WEST INDIES - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95 Apple disk with classroom management system $29.95.

5. THE MIDDLE EAST - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

6. SOUTH AMERICA - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

7. AUSTRALIA/NEW ZEALAND/ANTARTICA - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

8. CANADA - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

9. MEXICO - Intellectual Software - Tutorial and drill on the countries and other important features. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

10. WORLD GEOGRAPHY SERIES - Intellectual Software. All of the above, 9 Apple, IBM PC disks $150.00, Apple disk with classroom management system $240.00.

11. NEW ENGLAND - Intellectual Software. Tutorial and drill on the important geographic, economic, and demographic features of Maine, New Hampshire, Vermont, Massachusettes, Connecticut, and Rhode Island, Apple, IBM PC idsk $19.95, Apple disk with classroom management system $29.95

12. MIDDLE ATLANTIC - Intellectual Software. Tutorial and drill on the important geographic, economic, and demographic features of New York, New Jersey, Delaware, Pennsylvania, Maryland, and Washington, D.C. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

13. SOUTHEAST - Intellectual Software. Tutorial and drill on the important geographic, economic, and demographic features of Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Puerto Rico, and the Virgin Islands. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

14. MIDWEST - Intellectual Software. Tutorial and drill on the important geographic, economic, and demographic features of Ohio, Indiana, Missouri, Iowa, Illinois, Wisconsin, Michigan, and Minnesota. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

15. DEEP SOUTH - Intellectual Software. Tutorial and drill on the important geographic, economic, and demographic features of Tennessee, Kentucky, Alabama, Louisiana, Mississippi, Texas, Arkansas, and Oklahoma. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

16. CENTRAL - Intellectual Software. Tutorial and drill on the important geographic, economic, and demographic features of Kansas, Nebraska, North Dakota, South Dakota, Wyoming, Montana, Colorado, Utah, and Idaho. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

17. FAR WEST - Intellectual Software. Tutorial and drill on the important geographic, economic, and demographic features of Arizona, New Mexico, Nevada, California, Hawaii, Oregon, Washington, Alaska, and Guam. Apple, IBM PC disk $19.95, Apple disk with classroom management system $29.95.

18. UNITED STATED GEOGRAPHY SERIES - Intellectual Software. All of the above. 7 Apple, IBM PC disk $125.00, Apple disks with classroom management system $195.00.

19. TOURING AMERICA - E. David. A map skills exercise program in a game environment, in which students are asked to construct a tour from a starting state to an ending state, choosing the longest route possible (overland only) without repeating any states. Elementary map readers will need a map nearby in order to do the tour, while advanced students may be able to visualize the map so well that they do not need such help. TRS-80 cassette $24.95, diskette $29.95.

20. TOURING - E[illegible]avid. "Getting From Here to There" A set of map skills exercise programs in a game environment, in which students are asked to construct a tour from a starting location to an ending location, choosing the longest route possible (overland only), without repeats. There are five programs, treating Africa, America, Europe, Asia, and Latin America. The AMERICAN program is identical to TOURING AMERICA (above) except that there are no graphics. 16K Apple, PET, TRS-80 cassette $99.00, diskette $104.00.

21. GEOGRAPHY #1 - Academic Hallmarks. 400 Questions on Maps and Map Reading, Continents, Oceans, Seas, Islands, Lakes, Rivers, Deserts, Mountains, Latin American Geography. Apple disk $27.00.

22. GEOGRAPHY #2 - Academic Hallmarks. 400 Questions on United States Geography, National Parks and Monuments, Canadian Geography, Middle Eastern Geography. App disk $27.00.

23. GEOGRAPHY #3 - Academic Hallmarks. 400 Questions on Australian Geography, New Zealand Geography, African Geography, Asian Geography, European Geography. Apple disk $27.00.

24. GEOGRAPHY SERIES - Academic Hallmarks. All three of the above, 1200 Questions on 3 Apple disks $63.00.

25. PROFESSOR GEOG (SERIES B) - Alpha. Using a mixed graphics and text mode, the program tests the user's knowledge of continents, rivers, mountain ranges, and bodies of water. The user may select one or all of these categories, or may choose a specific continent to study. The selection menu appears as follows: General World Geography, Rivers of the World, Mountains of the World, Bodies of Water, Specific Continents - Africa, Asia, Australia, Europe, North America, South America. Apple disk $19.95.

26. GEOGRAPHY (NEIGHBORS) - E. David. A set of map skills exercise programs in a game environment, in which students are asked for the neighboring states (countries) of a given state (country). The programs (Africa, America, Asia, Eruope, and Latin America) are intended for fourth grade students and up, but adults will find them quite challenging also. 16K Apple, PET, TRS-80 cassette $99.00, diskette $104.00.

27. COUNTRIES AND CAPITALS - Micro Learningware. Allows the student to review countries and their capitals. Drill and practice (with scoring) included as well. Covers: South America, Central America, Provinces of Canada, and Europe. Apple, TRS-80I or III, Radio Shack Color, PET, Com. 64 and IBM disk $29.95. TRS-80, Radio Shack Color, PET and Com. 64 cassette $29.95.

28. REGIONS OF THE UNITED STATES - Educational Activities. Students review the states, region by region. Then they choose eigher a Beginner's Quiz that requires them simply to identify the states or a Super Quiz that only requires them to both identify the states and spell their names correctly. Then the computer selects a region and gives clues about it. Teaches the major cities, landforms, products, and climates of the different regions of the United States. Apple, PET, TRS-80, Atari disks. $59.00.

29. STATES-CAPITALS - DES. A program on the 50 states and capitals of the USA. The user (student) is prompted by one of two random questions about a state or its capital. At any time the user may type 'end' and the computer will give the number of problems, number correct, number computer gave answer on, etc. If the user does not know the answer, the computer will automatically give it. Comm. 64 cassette $18.00.

Behavioral Science (20%)

1. PSYCHOLOGY - Academic Hallmarks. 400 Questions on Psychology History and Systems, Defense Mechanisms, Abnormal Psychology, Personality, Motivation, Emotion, Thinking and Intelligence, Learning, Sensation and Perception, Social Psychology, Psychological Testing, Psychotherapy, Sleep and Dreaming, Physiological Psychology. Apple Disk. $27.00.

2. LABORATORY IN COGNITION AND PERCEPTION - Conduit. Eleven experiments in contemporary human psychology with student's notes (100 pages) and instructor's guide (100 pages). Apple, Pet, TRS-80 and Atari $140.00.

TEST 3 - Science

BIOLOGY (50%)

1. THE EAR - Micro Power and Light. The various parts of the outer, middle and inner ear are presented in logical working order. You see the shape and location of each part. You observe each alone and in relationship to the other part which it touches. You see vibration and movement. And for those who have black and white monitors rather than color, the disk includes a separate set of program modules to present the ear in successive outline drawings. As in color, each drawing has associated with it tutorial on a particular part of the ear. A further sophistication of the program allows the student to learn about the ear using either common or Latin terms. Apple disk $24.95.

2. CIRCULATION - Micro Power and Light. Two programs on circulatory organs and circulatory system. Apple disk $24.95 each, both for $59.90.

3. REPRODUCTION - Micro Power and Light. Two programs on reproduction organs and the reproduction process. Apple disk $29.95 each, both for $59.90.

4. THE HEART - Avant Garde. Blood flow structure, circulation, chambers identification, detailed color graphics, heart attack causes. Apple disk $29.95.

5. THE DIGESTIVE SYSTEM - Avant Garde. Digestive system, processing structure, identification, absorbtion, byproducts, hires, color graphics. Apple disk $29.95.

6. LIFE FUNCTIONS - Bio Learning Systems, Inc. This disk offers a visual learning experience - a classic lesson in the life functions coupled with a dynamic graphic presentation. The student sees the Hydra ingest its food, transport digested nutrients, synthesize a protein, incorporate this protein into the cell membrane, form buds etc. Each of the 13 life functions is listed, explained, illustrated and defined. Clear distinctions are made between excretion/egestion - locomotion/transport. A self-generating test accompanies this unit. Includes study sheet, teachers guide and a separate test disk. Apple disk $60.00.

7. HI RES BIOLOGY - J & S Software. Tutorial with branching on cells, transport, asexual reproduction, excretion, endocrine systems, biochemistry, digestion, locomotion, photosynthesis, reproduction in plants, respiration, genetics, animal reproduction and classification. 15 programs, over 10 hours of instruction. 5 Apple, TRS-80 Model III disks $250.00.

8. GENERAL BIOLOGY - Educational Courseware. Drill on plants, animals, hormones, digestion. Apple disk $36.00.

9. TYC BIOLOGY PACKAGE - TYC Software. Cell Division & Genetics, Plants & Ecology (Human System), Digestion & Circulation, Respiration & Excretion, Nervous & Endocrine Systems, Reproducation & Muscle and Bones & Individual Study Center. Apple disk $84.70, TRS-80 cassette $89.70, TRS-80 disk $99.70.

10. LINKOVER - GENETIC MAPPING - Conduit. Students plan and execute genetic mapping experiments. Reinforces concepts of linkage and crossing for ten genes of a hypothetical diploid species. Student notes (6), Teacher's Guide. Apple disk, TRS-80 disk $40.00. Additional manuals $1.50.

11. EVOLUT - EVOLUTION AND NATURAL SELECTION - Conduit. Introduces evolution and population genetics. Students select various parameters, such as zygote type, percent of green alleles, number of generations. Learn mechanism generating variation and the selection process leading to adaptation, adaptations of environmental conditions in relation to survival values, etc. Student notes (6), Teacher's Guide. Apple disk, TRS-80 disk $40.00 Additional manuals $1.50.

12. OSMOSIS AND DIFFUSION - E.M.E. Using color graphics, this simulation examines a vital life process - the flow of matter across a semi-permeable membrane. Part I introduces the basics of random motion, diffusion and osmosis. In Part II, a what if mode, students identify and control the factors that influence movement into and out of the cell: temperature, concentration, solubility, molecule size and charge, membrane pore size. Includes a review quiz, 25 student lab booklets and a study guide. Apple II disk $36.00, TRS-80 Model I and III disk $39.00.

13. INTRODUCTORY GENETICS - E.M.E. Part I includes "Patterns of Heredity", "Simulations of Mono and Dihygrid Crosse", "Sex-linked Inheritance", "Geno-type/phenotype Determinations". Part II includes: Punnett Square interactive exercises, Dominant and recessive genes, Homozygous and heterzygous offspring, Variable gene frequency. Part III includes: Inbreeding effects, Simulated crossing of related individuals over generations to show inheritance of lethal genes, Avoiding inbreeding, Student Lab Booklets, Study Guide. Apple disk $47.00.

14. POPULATION FLUCTUATIONS - E.M.E. Colorful animation and diagrams enliven study of the factors influencing population growth. Exponential growth, growth limited by carrying capacity and the effects of low-breeding density. Students manipulate variables in simulated experiments to solve realistic, contemporary population problems. Screen displays data table and graph output. Student Lab Booklets, Study Guide. Apple disk $42.50. TRS-80 Model I and II disk $44.25.

15. NATURAL SELECTION - E.M.E. Part I includes: Relating genetics concepts to populations, Selection pressure applied by a lethal homozygous recessive condition to see changes in frequency and response of the recessive allele overtime. Part II includes: Evolution, Interactive simulation of a classic case: changes in phenotype frequency in a moth population due to environmental factors, Students vary allele frequencies, number of generations, selection pressure and pollution levels. Results displayed by graphics of predation pressure and population phenotypes, and by plots of pollution levels, tree trunk darkness and phenotype percentages. Study Guide. Apple disk $35.00.

16. GENETICS - Microcomputer Workshops. Explains the basic laws of inheritance. Includes dominant, recessive, sex-linked dominant and recessive, and sex-influenced characteristics. A two or three genration family tree is displayed on which the student is tested. Error analysis and explanation. Apple disk $24.95.

CHEMISTRY (20%)

1. ACID-BASE CHEMISTRY - Programs for Learning, Inc. Demonstrates acid-base equilibria; pH changes in buffer solutions. Drill on recognition of Bronsted acids and bases and a variety of fundamental concepts e.g. conjugate acids/ bases and relative strengths of acids. Practice problems concerning pH, pOH for solutions of acids, bases and buffers of varying strengths. Titration simulation. Problems concerning standardization with potassium acid phthalate and determination of PH problem exercise presented in stages arranged in order of increasing complexity. Titration curve demonstration and practice problems. Eleven programs with instructor's guide. Apple, PET, TRS-80 cassettes or disks $150.00.

2. INTRODUCTION TO GENERAL CHEMISTRY - ComPress. Designed as a stand-alone supplement to an introductory course in GeneralChemistry for students who have no previous chemistry background. Simulated experiments used to develop basic concepts allow students to gain experience in collecting and interpreting data. Five disks include: THE CHEMICAL ELEMENTS, INORGANIC NOMENCLATURE, CHEMICAL FORMULAS AND EQUATIONS, ATOMIC WEIGHTS, and PERCENT COMPOSITION. 5 Apple disks $340.00, $60.00 each.

3. CHEMISTRY - J & S Software. 15 programs: 1. Moles and Formulas - converting grams to moles, number of molecules to moles, as well as Avosadro's relationship and percent composition; 2. Chemical Equations - balancing equations, mole relationships in equations and weight-problems; 3. Gas Relationships - Boyle's Law, Charles' Law, partial pressure, volume-volume equation relationships, weight-volume equation problems and densities of gases are covered in this unit. $. Solution - naming, ion concentration, molarity, calorie problems, and the formation of precipitates; 5. Periodic Table - formulas, atomic radius, mass number, ionization energy, activity, combining capacity, and the number and type of each type of particle in an atom; 6. Electron Structure - orbitals, valence electrons, electron structure, filling of sublevels and the relationship of valence elctrons to the periodic table.

7. Bonding in Molecules - covalent and ionic bonding, problems covering bonding properties, and the relationship of bonding to the periodic table; 8. Bonding Between Molecules - hybridization, shapes of molecules, Van der Waals forces, and network bonds; 9. Kinetics - reaction rates, collision theory, heat of reaction, and activation energy; 10. Acid Base Theories - Bronsted Lowry theory, naming acids, neutralization reaction and salts; 11. Acid Base Problems - pH, titration problems, dilution of acids and the neutralization of solid bases; 12. Electrochemical Cells - questions pick random variables for problems on electrochemical cells, voltages, oxidizing and reducing agents in cells, and the direction of both electron flow and ion flow; 13. Oxidation Reduction - oxidation numbers, half reactions, balancing oxidation reducation reactions and determining the number of electrons lost and gained; 14. Equilibrium - Le Chatelier's principle, calculating the equilibrium constant and relating Ksp to solubility of a compound; 15. Organic Chemistry - identifying isomers, names of simple hydrocarbons and their isomers, functional groups, and some types of reactions are asked. Hi Res Apple disks $28.00 each, all 15 for $250.00. TRS-80 cassettes $23.00 each, all 15 for $185.00.

4. CHEMISTRY #1 - Academic Hallmarks. 400 Questions on Periodic Table and Elements, Chemical Compounds, Acids, Bases and Salts, Chemical Bonds, Solutions and Suspensions, Ions. Apple Disk. $27.00.

5. CHEMISTRY #2 - Academic Hallmarks. 400 Questions on Chemistry History, Chemical Laws and Theories, Atomic and Molecular Structure, Chemical and Physical Changes, Metals, Gases, Crystallography, Electrolysis, Organic Chemistry, Distillation, Halogens, Hydrates, Mixtures. Apple Disk $27.00.

6. COMPOUND ID, MASS, MOLES - Redcomp. Provides practice with the naming conventions, molecular weights and symbols, problems involving molarity. 23 compounds are used at random in the molarity problems. A table of atomic weights is provided upon request. The student is given the solute volume in ML, the dissolved compound's name, and the molarity. Problem: to find the number of moles in the solution and the number of grams of solute. A demonstration of the methods is given upon request or if a problem is attempted unsuccessfully twice. TRS-80 cassette $22.95, Apple, TRS-80 disk $29.95.

7. MOLECULAR WEIGHTS & COMPOUND RECOGNITION - Redcomp. Provides practice computing molecular weights and determining stoichiometric formulas from the names of the inorganic compounds. The chemical name of an inorganic compound is given and the student is told to find the molecular weight to the nearest hundreth. (A table of atomic wts. is supplied as a part of the program, and may be called by the student when needed.) TRS-80 cassette $22.95, Apple TRS-80 disk $29.95.

8. ELEMENT REVIEW - Educational Curriculum. Drill, Pet Cassette $15.00.

9. ACID BASE TITRATION - Educational Curriculum. CAI, Pet Cassette $35.00.

10. MOLARITY - Educational Curriculum. CAI, Pet Cassette $20.00.

11. OXIDATION NUMBERS - Educational Curriculum. Drill, Pet Cassette $15.00.

12. MOLE PROBLEMS - Educational Curriculum, CAI, Pet Cassette $20.00.

13. ENTIRE SET - Educational Curriculum. All 5 of the Above on a Pet Disk $80.00.

Earth Science (20%)

1. ASTRONOMY - Academic Hallmarks. 400 Questions on Astronomy History, Stars and Planets, Moon and Sun, Eclipses, Universe, Astronomical Theories, Gravity, Stellar Spectroscopy, Space Programs. Apple Disk. $27.00.

2. GEOLOGY #1 - Academic Hallmarks. 400 Questions on Geology History and Theories, Geologic Time, Paleontology, Earth's Crust and Interior, Earthquakes, Volcanoes, Glaciers. Apple Disk. $27.00.

3. GEOLOGY #2 - Academic Hallmarks. 400 Questions on Mineralogy and Petrology, Igneous Rocks, Sedimentary Rocks, Metamorphic Rocks, Sedimentation and Speleology, Soils and Statigraphy, Weathering and Erosion, Hydrology, Ores. Apple Disk $27.00.

4. METEOROLOGY - Academic Hallmarks. 400 Questions on Atmosphere, Temperature and Pressure, Wind, Clouds and Humidity, Fronts and Air Masses, Seasons and Climates, Weather Instruments, Storms and Precipitation. Apple Disk $27.00.

5. EARTH SCIENCE SERIES - Academic Hallmarks. All four of the above, 1600 Questions on 4 Apple disks. $84.00.

6. EARTHQUAKES - Aquarius. Hi-res graphics, sound color, interactive tutorial includes lessons and practice on locating earthquakes via latitude and longitude, Teacher's Guide. Apple disk $34.95.

*7. EARTH SCIENCE SERIES - TYC. Contains 12 independent programs - High School level: Gradient, Heat Energy Lost and Gained, Latitude and Longitude, Basic Chemistry, Stream Erosion, Water Budget, Seismic Waves, Earth History, Seasons, Metrology and Percent Error. Designed by educators to meet specific classroom needs, the programs are illustrated with numerous graphics. Students are quizzed throughout to reinforce information learned. A teacher/student manual is included which contains student objectives, worksheets, answer keys and general student user instruction. TRS-80 Model III disks (2) $78.50. Model I or III cassettes $68.50.

8. ENERGY CONVERSIONS - HRM. This program has two objectives. First it offers a resource base for all energy studies by showing how to convert one energy unit into another (i.e., tons of coal into barrels of oil). This can enable students to project fuel consumption in relation to changing fuel prices and availability. Second, the program provides opportunities for problem solving with the use of the conversion factors. Students are asked to set up problems based on fuel type and efficiency, fuel use, and energy produces. Apple, TRS-80 Model III disk $29.00.

PHYSICS (15%)

1. PROJECTILE AND CIRCULAR MOTION - E.M.E. Three programs take the student step by step through problem solution. Projectile motion, circular motion and constant angular velocity, circular motion and changing angular velocity. Study Guide. Apple disk $30.00.

2. STATICS AND DYNAMICS - E.M.E. Seven analytical programs effectively utilizing color graphics in combination with crisp text. Equilibrium systems, support beams, ladder loads, masses on inclined planes, multi-body systems with translational and/or rotational acceleration. Study guide. Apple disk $105.00.

3. COLLISIONS/HARMONIC MOTION - E.M.E. Six thought-provoking programs. Elastic and inelastic collisions in one dimension. Two-dimensional inelastic collisions. Simple harmonic motion utilizing a reference body with constant angular velocity. Study Guide. Apple disk $35.00.

4. CONSERVATION OF ENERGY AND MOMENTUM - E.M.E. Five programs analyzing dynamic systems with color graphics and text. Basic concepts, effect of conservative and non-conservative forces, linear momentum recoil experiments, angular momentum rotating one and two-body systems. Study guide. Apple disk $65.00.

5. ELECTRICITY - E.M.E. Four programs using color-graphic displays of electric fields. Electric and magnetic field between current-carrying conductors (Ampere's Law). Simulation of Wheatstone Bridge experiment. Study Guide. Apple disk $55.00.

6. COMPLEX CIRCUITS - E.M.E. Four interactive programs featuring color graphics. Determination of charge, potential and current through capacitor and/or resistor circuits (series and parallel). Varying resistance and capacitance to explore circuit response by plots of charge and current. Experiments on frequency selections and current output. Equal reactances and phase angle. Study Guide. Apple disk $60.00.

7. MIRRORS AND LENSES - E.M.E. Activities in geometrical optics with sharply defined graphics of reflected and refracted light rays. STudents predict the location of real and virtual images formed by concave or convex mirrors, and converging or diverging lenses. Study Guide. Apple disk $30.00.

8. PHYSICS #1 - Academic Hallmarks. 400 Questions on Matter, Change of State, Mass, Weight, and Density, Atomic Structure, Measurement in Physics Instruments and Apparatus, Principles, Theories, and Laws, Fluids and Gases. Apple Disk. $27.00.

9. PHYSICS #2 - Academic Hallmarks. 400 Questions on Waves, Sound, Magnetism, Light, Color, and Optics, Spectroscopy, Energy, Atomic Energy and Radiation. Apple Disk. $27.00.

10. PHYSICS - J & S Software. 12 programs on the circular motion, acceleration, free fall, momentum, Newton's Law, uniform motion, projectible problems, work and energy, heat, waves, gas law, and sound. Hi-res pictures of experimental set-ups, graphs and charts. Incorrect response to questions results in the student getting new information on the topic. A separate file, accessible only to the teacher, stores information on student progress. These programs are keyed to most high school textbooks and emphasize problem solving. 5 Apple disks $195.00.

11. PHYSICS PACKAGE - Cross. Twelve disks each containing numerous programs on vectors, statics, motion, conservation, circular motion, thermodynamics, electricity and magnetism, optics, atomic physics, solar system astronomy, stellar astronomy, and physics gems. 12 Apple disks $260.00.

12. PHYSICS I - Microphys. Generates series of questions on each of 13 topics in elementary physics. Topics include projectile motion, inelastic collisions, centripetal force. Apple, PET, Com. 64, IBM PC, TRS-80 disks $200.00.

13. PHYSICS II - Microphys. Generates series of questions on each of 13 topics in more advanced physics. Topics include Gas Laws, Thermodynamics, Waves. Apple, Pet, TRS-80, Com. 64, IBM PC disks $200.00.

*14. PHYSICAL SCIENCE PROGRAMS - J&S. The main concepts in 14 physical science areas: Matter, Atoms, Families of Atoms, Bonding, Reactions, Acids and Bases, Carbon Chemistry, Radioactivity, Motion, Energy, Light, Sound, Electricity, and Magnetism. Each program contains numerous hi-res graphics. Program automatically branches to a sub-program on any concept in the main program in which the student has difficulty. Student scores are recorded. Apple disks $29.00 each. All 14 programs on seven disks. $250.00.

15. PHYSICS - ELEMENTARY MECHANICS - PLATO. Tests ability to solve problems in principles of mechanics. Intended for senior high physics students. Apple, Atari 800, TI 99/4A $70.00.

Test 4 Reading Skills

Remedial - Grade 5-6 Level

1. READING COMPREHENSION GRADE FIVE - Intellectual Software. Fifth grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00, (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00).

2. READING COMPREHENSION GRADE SIX - Intellectual Software. Sixth grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00, (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00.

3. PHRASE READING I an II - Creative Curriculum. This reading improvement program is designed to help people who are 12 years of age or older and who are reading at a level far below their age group. This product is also an excellent aid to those who are learning English as a second language. The computer presentation includes these features: proportional spacing, upper/lower case bold letters, highlighted lines, exclusive Ghosted Image, black letters on white background or white letters on black background. User controlled rate of presentation. Each of the lessons contained in this program is divided into five sections: new vocabulary words with pronunciation and sample usage, basic perceptual training (eye-movement practice), skill practice in reading phrases (through units), reading story of suspense specifically formatted to take advantage of your new skills, comprehension questions to measure your growth. Every other lesson has the reading story in the skillbook rather than on the computer so that you will transfer what you have learned with the computer to the printed page. The Stories of Suspense used in this program are original adaptations of World Famous Short Stories by such authors as Edgar Allen Poe, Rod Serling, Guy de Maupassant, Shirley Jackson, etc. Each story has been made easy reading without compromising the author's suspenseful endings. Throughout this program you are in complete control of the learning process. 2 Apple disks $119.90.

4. READING COMPREHENSION II - Random House - BLS. Reading Level grade 5-6, Content level 4-7. 12 Apple diskettes, available separately at $60.00 each: Basic Library Skills; Finding the Book You Want; Graph and Map Reading; Counting Roman Numerals and Walking Directions; Words Cut and Tongue Twisters; Solving Problems by Following Directions; Related Sentences and Identification of Paragraphs; Figures of Speech, Inference Facts; Main Ideas; Title and Turning Points; and 3 disks on Understanding Paragraphs (162.00 for all 3). Package also includes 4 test diskettes for a total of 16 Apple 48K diskettes $612.00.

5. MR. READWELL - GRADE 4-5 PACKAGE - Micrograms. Four programs: Each program consists of numerous short selections and corresponding comprehension questions. A reading rate may be set to control the speed at which the words are cleared off the screen. With the emphasis on comprehension rather than rate, the student is asked if he/she understood the selection before the comprehension questions are asked. If a student experiences difficulty in understanding a selection, he/she may choose to read it through again before being presented with the questions. 4 PET cassettes $51.80, PET disk $54.80 4 Com. 64 cassettes $59.80, Com. 64 disk $62.80.

6. MR. READWELL - GRADES 5-6 PACKAGE - Micrograms. Four programs similar to above. 4 PET cassettes $51.80, PET disk $54.80 4 Com. 64 cassettes $59.80, Com. 64 disk $62.80.

7. SEQUENCING SAM - GRADE 4-5 PACKAGE - Micrograms. Four programs: Students read a given selection. The computer asks if the student understood the selection or if he/she needs to reread it. When the student feels comfortable with his/her understanding of the selection, the computer presents a series of events which the student is required to sequence. When events are sequenced incorrectly, students are required to reread the selection and correct their responses. The computer will advance to the next story selection when all answers are correct. Motivational graphics and reasonable grade level expectations help to keep children encouraged and on task. 4 PET cassettes $51.80, PET disk $54.80 4 Com. 64 cassettes $59.80, Com. 64 disk $62.80.

8. SEQUENCING SAM - GRADES 5-6 PACKAGE - Micrograms. Four programs similar to above. 4 PET cassettes $51.80, PET disk $54.80, 4 Com. 64 cassettes $59.80, Com. 64 disk $62.80.

Intermediate (Grades 7 - 8 level)

1. READING COMPREHENSION GRADE SEVEN - Intellectual Software. Seventh grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00, (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00.

2. READING COMPREHENSION GRADE EIGHT - Intellectual Software. Eighth grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00. (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00.

3. READING COMPREHENSION III - Random House-BLS. Reading level 7-8, Content level 7-10. 16 Apple diskettes, available separately at $60.00 each: Information in the Dictionary; Using the Pronunciation Guide; Homographs and Homonyms; Using Meanings and Definitions; Derived and Irregular Forms; Following Oral and Graphic Instructions; Using Symbols and Automatic Machines; Codes and Arithmetic; Exercises in Following Directions; Paraphrasing Key Words and Inferences; Sentence Paragraph Relations; Facts Relating to Paragraphs; Words and Paraphrases; Main Facts and Key Ideas; Inferences Purposes and Conclusions (2 disks $60.00) All 16 Apple 48K disks $816.00.

4. PHRASE READING I - Creative Curriculum. Famous stories of suspense. Reading improvement program covers five basic areas; new words, tachistopic number memorization, phrase reading, story reading and comprehension question. Student records progress in 70 page student skillbook. Apple disk $49.95.

5. PHRASE READING II - Creative Curriculum. Suspense stories used in this program are substantially longer and give the user more practice than Phrase Reading I. Stories used are adapted from famous authors such as Rod Serling, Shirley Jackson and Edgar Allen Poe. Apple disk $59.95.

6. DESCRIPTIVE READING - Educational Activities. Six tests on main ides, details, fact/opinion, vocabulary, sequence and inference. Classroom tested at Lindenhurst Junior High School, Long Island, NY. Apple, PET, TRS-80, Atari disk (7) $365.00; PET, TRS-80 Atari cassettes (15) $295.00.

7. READING COMPREHENSION I - Milton Bradley. Program includes recognizing topic sentences, listing supporting details, summarizing main ideas, choosing titles, and evaluating details. Apple disk $49.95.

Reading - Advanced

1. READING COMPREHENSION IV - Random House - BLS. Reading level 9-10, Content level 8+. 13 Apple disks available separately for $60.00 each: Choosing a Topic; Selecting Appropriate Informations; Using the Encyclopedia; Finding Sources - The Card Catalog and Reader's Guide; Paraphrases, Inference and Point of View B; Symbols and Directions; Paraphrases, Inference and Point of View C; Source of Reference; Using Internal and External Evidence; Assumptions and Elements of Humor; Theme Style and Metaphor (2 disks $60.00) and Implication, Attitude, Symbolism, Image and Onomatopoeia. All 13 Apple 48K disks $663.00.

2. ADVANCED READING COMPREHENSION - Intellectual Software. Challenging reading comprehension exercises for college, adult and intellectually-gifted children. Each question fully analyzed, each answer fully explained. 2 Apple IBM PC disks $35.95 each, both for $65.00, (IBM version on one disk), Apple disks with sophisticated management system, $44.95 each, both for $85.00.

3. ENGLISH READ MASTER - LEVEL III - RG Computer Workshops. Grades 10-12. Five original stories, each composed of 10 passages. Each passage contains a blank space representing a missing word or expression, for which 4 possible completions are provided, and the student selects the completion that makes the best sense in the context of the passage. Apple disk $34.95.

4. READING COMPREHENSION III - Dorsett. Reading material on auto mechanics: checking out a used car; overhauling the car's engine; increasing the car's performance; facts about the car's mechanism; terms a mechanic uses; the car's electrical system; the automobile mechanic career; the mechanic and his tools; safety in the shop, color code; the diagnostic center; engine displacement in cubic inches; converting to the metric system; mileage, fuel performance; computing changes and labor costs; replacing a burned out fuse; and credit interest, paycheck deductions. Atari, TRS-80 cassettes $59.00.

5. READING COMPREHENSION IV - Dorsett. Reading materials on general shop practices: tool identification; fasteners and hardware; proper lubricant for small engines; performing periodic services; operation of the four-cycle engine; discussion of a two-cycle engine; use of micrometers and calipers; measuring, marketing, cutting metal; soldering electrical connections; the actylene torch, safety rules; cutting and welding; electric arc welding, terms, types, unsafe situations, preventions; employment hints; and discussion of business etiquette. Atari, TRS-80 cassettes $59.00.

(Comprehensive)

*1. PAL - Universal Systems for Educational Inc. Uses a diagnostic/remediation approach to teaching reading. Covers the entire scope of reading education for grades two through six. The curriculum has been developed through seven years of field testing, and has been validated against the top seven textbook reading series in the United States. Diagnoses the specific deficiencies in a child's reading ability, and prescribes remediation exercises directly targeted at the problem diagnosed. Evaluates up to forty major reading skills and up to 160 subskills per grade level. Uses a friendly, personalized approach that is non-threatening to the poor reader. A primary emphasis allowing every child to experience success. Consists of two parts: The Master Disk operates all the grade level programs, and will also run the PAL Language Arts and Mathmatics curriculums to be introduced later this spring. The Master Disk contains an upper/lower case chip for the Apple II, which allows PAL to present exercises in a "real world" format. Each Reading Package contains a Discovery Disk, which performs diagnostic testing, and one or two Learning Disks, which provide 300-400 remediation exercises for each grade level. Keeps records for up to 100 students and gives an update on each student's progress every time he/she signs on the machine. Flexible sequencing through the objectives, so that a customized program can easily be developed for each child. Apple disk. Master disk $99.95. Reading packages, grades 2-6, $99.95 each.

2. PROFESSOR SNEAD - Micrograms. Professor Snead lectures on the advantage of reading rapidly but explains also that rate is secondary to comprehension. He allows the student to select a reading rate before presenting each of nine story segments. Each segment is in turn followed by comprehension questions. Professor Snead will indicate how many questions were missed without directing the student to specific errors. The segment must be reread and the questions correctly answered before progressing to the next story part. Four packages: Grade 5-6, Grade 6-7, Grade 7-8, Grade 8-9. Each package consists of 3 cassettes or one disk. Package prices: PET cassettes, $38.85, disk $41.85, Com. 64 cassettes, $44.85, disk $47.85.

3. LANGUAGE/READING DEVELOPMENT PROGRAM - Software Technology for Computers. A language and reading program appropriate for the elementary student and the adult. Its objectives are: develop speed while maintaining and improving perception skills, increase concentration habits, promote spelling and precise response procedures, develop vocabulary through word recognition, expand vocabulary through drill exercises exploring synonyms and antonyms, and transfer gained speed, word recognition and expanded vocabulary to the solving of analogies. Features include, musical reinforecment option, 995,000 potential combinations, no multiple choice selection and 150 pages of loose-leaf instruction manual worksheets, study guides and word lists. Apple Disk $175.00.

4. READING SKILLS LAB - NTS. The most comprehensive reading package on the market. RSL is available for each grade, levels one to nine, and helps develop skills in a variety of areas necessary to good reading. The programs for each grade level use a core vocabulary list containing words which occur most frequently in the most widely-used basal reading series in public school systems today. Also included in each set are original short stories by professional children's authors. These stories have been selected for high interest value, and are matched to the reading level of each set. Each story is presented with its own set of exercises relevant only to that story. These exercises can be used to complement a language arts program by providing additional practice in using the core vocabulary words at each grade level. This repetition and reinforcement will help students acquire the language development skills needed as they progress from level to level. In addition to the presentation of the exercises on the computer screen, each program has an optional printer module that allows the teacher to prepare printed exercises for use by students away from the computer. These exercises are similar to the main exercises in each program, and may be used in a variety of ways. The teacher may request a single copy of any printed exercises, or an entire classroom set. An option allows the teacher to specify whether all copies in the classroom set should be identical, or each one different from the others. If desired, the computer will randomly choose items from the exercise list in order to provide a distinct exercise for each student. The following programs are included for each grade level: MATCHWORD - A word recognition drill that gives practice in visual discrimination, left-to-right directionality, and scanning for a particular word. MEANINGS - Additional practice with the core vocabulary words, with the added dimension of meaning. The student is asked to match a word to its meaning or synonym. SENTENCE SENSE - The core vocabulary words used in context. This program also deals with word meanings; the student is asked to choose the word which best fits into a given sentence. READING FUN - This section contains the stories for actual reading practice. Students may "page" forward or backward in the story as it is presented on the screen. Each story is preceded by pre-reading vocabulary exercises, and followed by comprehension exercises and post-reading vocabulary exercises. The main idea, the some inference questions. WORD FUN - Each level also includes a word game that incorporates the core vocabulary words for additional reinforcement. These games differ from one level to another; some may also be printed on the printer. TRS-80 Model III disk Grade Levels 1-3 $350.00, Grade Levels 4-6 $350.00, Grade Levels 7-9 $350.00. Complete set Grade levels 1-9 $1000.00.

LANGUAGE ARTS - Reading - Speed Reading

1. STEPS TO ADVANCED READING - SPEED READING COURSEWARE - Creative Curriculum. Utlizes serial tachistoscopic training and expanded line training to develop wider peripheral vision resulting in fewer eye movements. This is not courseware in how to "skim". The goal - a reading rate in excess of 500 words per minute - or, an improvement of 2 1/2 times, while maintaining 100% comprehension. High interest and motivational levels are maintained through use of informative articles. Includes 20 programmed reading lessons, supplemental reading book, pre and post tests, answer sheets and storage binder. 2 Apple disks $99.00.

2. COMPUTERIZED SPEED READING AND COMPREHENSION - Abbott Educational Software. Six programs. 16K Pet Cassette $49.95.

3. SPEED READING MASTER - RG Computer Workshops. Variety of speeds and reading levels with graphics. Clinic tested. Apple disk $24.95.

4. THE SPEED READER II - Davidson & Associates. A complete reading development course. Its professionally-designed exercises with help build reading speed and improve comprehension with just 30 minutes of practice each day. Chart your reading speed with 34 interesting reading selections and check your comprehension with questions that follow each selection. Contains an easy-to-use editor which allows you to enter your own material and a grade level analyzer to determine reading level. 2 Apple, IBM disks $69.95.

TEST 5 - Mathematics

Arithmetic (55%)

(Apple)

1. MATHEMATICS GRADE 6 - Intellectual Software. Comprehensive tutorial and drill packages based on the excellent books by Dr. Irving Adler. Includes counting to 100,000,000,001, adding, subtracting, multiplying, dividing, fractions, mixed numbers, decimals, rate, time, distance, area, perimeter, volume, Roman numerals, some arithmetic laws. 4 Apple disks, $79.95, with classroom management system, $119.00.

2. MATHEMATICS WORD PROBLEMS GRADES 6-8 - Intellectual Software. Working with word problems, each problem fully explained, 3 Apple disks each for grades 5-8, $59.00 per grade. All 3 grade levels, 9 Apple disks $175.00.

3. PROBLEM SOLVING COMPUTER TUTOR - RG Computer Workshops. Tutorial lessons and practice exercises focus on six major areas of Problem Solving: 1) Choosing the correct operations, 2) Too much or too little information, 3) One Step problems, 4) Two step problems, 5) Reading a Menu, 6) Travel problems. In the Tutorial Mode the computer walks the student through the correct procedure to solve the problem. As the student progresses through the program he becomes more and more actively involved in solving the problem. In the Practice Mode the student is requested to solve specific problems. If the student responds incorrectly the computer provides an explanation immediately after the problem is presented. Apple disk $74.95.

4. PLANE FACTS ABOUT GEOMETRY - Sunburst. (Formerly MECC Mathematics Volume 3). Formulas, Shapes, and Skills. Five programs make extensive use of graphics to teach basic geometric shapes and give definitions and formulas for rectangles, squares, parallelograms, trapezoids, rhombuses and triangles. A drill-and-practice program called "Geometric Shapes" leads off, followed by four tutorials with drill-and-practice options. "Perimeters" shows how to calculate perimeters of the six basic geometric shapes. "Rectangle and Square Areas" helps students calculate the areas of rectangles and squares. "Parallelogram Areas" compares formulas for determining parallelogram and rectangle areas, while "Trapezoids and Triangle Areas" does the same for the areas of these two geometric shapes. Extensive Documentation. Apple disk $30.00.

5. FRACTION/DECIMALS - Sterling Swift - AVAILABLE IN ENGLISH OR SPANISH. (Please specify) Six Apple diskettes on Meaning/Equivalence/Order of Fractions; Addition and Subtraction of Fractions; Multiplication and Division of Fractions; Decimals; Games; learning Management System Embedded Mastery Tests, Diagnostic/ Prescriptive Functions, Achievement Record-keeping Capability, Information Reports; Plus Documentation. Apple disk $495.00

6. FACTORING - Micro Power and Light. This program teaches the student how to factor polynomial expressions, containing a single variable, with the highest degree two. From a readily accessible main menu, the student is able to go directly to any of four sections of the programs: (1) The Distributive Porperty - this section generated and presented by the program, and the correct answer is given when requested by the student having difficulty; (2) The Factoring Game - this section of the program affords the student unlimited practice opportunities. Students working ten or more exercises become participants in the on-going "contest" monitored by the program. The student who gets all correct answers in the briefest period of time, holds the winner's title - until someone else does better!; (3) The Scheduled Quiz - the "Teacher mode", accessible by factoring exercises to be presented each student in the class. In student mode, the program generates and presents the exercises, keeps score and subsequently (back in teacher mode) shows the results to the teacher; (4) The Factoring Machine - in this section, the student can enter an expression to be factored and the program does it, step by step, at the student's pace. Apple disk $34.95.

7. BUILDING EXTIMATION SKILLS - Cuisenaire. Uses a hidden picture format tied to correct answers for questions involving rounding numbers, percent, addition, subtraction, multiplication, and division. Volume I provides practice rounding 2-7 digit whole numbers and estimating a percent of a number. Volume II provides practice with estimating the sums, differences, products and quotients of 2-7 digit whole numbers, and also provides practice multiplying and dividing whole numbers with trailing zeros. They also provide instruction on the concept of rounding for students who miss one or more problems. A 30-page booklet provides instructions for loading and running the diskettes, and a separate 24-page workbook gives follow-up activites to practice estimation skills. Apple disks (two) $65.00.

8. DECIMAL SKILLS - Milton Bradley. Program includes readiness skills, addition, subtractions, multiplication and division of decimals. Apple disk $49.95.

9. RATIOS AND PROPORTIONS - Milton Bradley. Program includes readiness skills, using data to write ratios and proportions, using data to solve stated proportions and to write and solve proportions. Apple disk $49.95.

10. PERCENTS - Milton Bradley. Program includes three methods for expressing and solving equations, solving for percentage, solving for the base, solving for the rate, solving equations through selected methods, solving for percent increase and decrease. Apple disk $49.95.

11. GENERAL MATH - Academic Hallmarks. 400 Questions on Math History. Numbers, Roman Numerals, Properties, Sets, Other Bases, Multiples, Factoring, Powers, Roots, Reciprocals, Series & Progressions, Ratio & Proportion, Probability, Combinations & Permutations. Utility Disk also available (see Teacher Utilities.) Apple disk $27.00.

12. WORD PROBLEMS - Academic Hallmarks. 400 Questions on Distance and Speed Problems, Work Problems, Mixture Problems, Tax Problems, Interest Problems, Discount Problems, Percent Problems, General Word Problems, Measurement. Utility Disk also available (see Teacher Utilities.) Apple disk $27.00.

13. COMPLEX OPERATIONS - Random House - BLS. 9 Apple disks. 4 on Averages, Rounding Off, Estimating and Factoring (60.00 each, all four for $216.00); 3 on Lowest Common Multiples, Exponents, and Square Roots ($60.00 each, both for $108.00). All of the above, 9 Apple 48K disks $459.00.

14. FRACTIONS - A REVIEW COURSE - Random House - BLS. 15 Apple disks. 4 on introduction to fractions: the fraction idea; comparing fractions; factors and prime numbers; multiples and lowest common multiples ($60.00 each, all four for $216.00); 4 on addition of fractions and mixed numbers ($216.00) 4 on addition of fractions and mixed numbers ($216.00) and 7 on subtraction, multiplication and division of fractions ($120.00) and one General Review ($60.00) All of the above, 15 48K Apple disks, $765.00.

15. DECIMALS - A REVIEW COURSE - Random House - BLS. 13 Apple disks. 4 on decimals, Fractions and Equivalents ($216.00); 5 on Addition, Subtraction and Multiplication of Decimals ($270.00); 4 on Division of Decimals ($216.00). All 13 of the above $663.00.

16. PERCENTAGE - A REVIEW COURSE - Random House - BLS 13 Apple disks. 3 on Fractions, Decimals, and Percents: Changing Fractions to Percent, Changing Percent to Fractions, Decimals and Percent ($60.00 each, all 3 for $162.00); 5 on Percentage Exercises Problems ($270.00) 5 on Discount, Taxes, Salaries and Profits: Discount, Taxes, Commissions, Interest, Profit + Loss, and Increase + Decrease ($60.00 each, all 5 for $270.00). All of the above 13 48K Apple disks $663.00.

17. ARITHMETIC FUNDAMENTALS - Random House - BLS. A comprehensive course on addition, subtraction, multiplication and division of whole numbers, fractions, mixed numbers, decimals, percents, measures and algebraic numerals. 19 Apple 48K disks $969.00.

18. DIVIDING FRACTIONS - Microcomputer Workshops. Provides practice in dividing fractions. Apple disk $24.95.

19. ADDING DECIMALS - Microcomputer Workshops. Provides practice in lining up and adding decimals of different lengths. Gives options as to number of problems, size of numbers, and amount of numbers to be added. Errors are immediately flagged and error analysis is given. Apple disk $24.95.

20. SUBTRACTING DECIMALS - Microcomputer Workshops. Provides practice in subtracting decimals of unequal lengths. Gives option to subtract with or without borrowing. Error analysis and explanation. Apple disk $24.95.

21. MULTIPLYING DECIMALS - Microcomputer Workshops. Provides practice in multiplying a 3-digit decimal number by a 1, 2, or 3 digit decimal number. Each digit of the product, the carry and the sum of the product is entered one digit at a time. Error analysis and explanation. Apple disk $24.95.

22. DIVIDING DECIMALS - Microcomputer Workshops. Provides practice in dividing a decimal number by a 1, 2 or 3 digit number containing a decimal. Student must reposition the decimal point in both the divisor and the dividend. Error analysis and explanation. Apple disk $24.95.

Apple and TRS-80

*1. TAKING INVENTORY - NTS. Three programs - 32 strands. This is a comprehensive diagnostic and prescriptive program designed to pinpoint and correct weak areas in each of 32 levels, from addition to fractions and decimals. Each strand contains a survey of pretest; four exercise levels; and a post-test. If a student passes the pretest, he is directed to the next strand. Otherwise, he is directed to the appropriate exercise to practice the skill the survey showed as deficient. After doing the appropriate exercises, he takes the post-test. If he passes with 85% or more, he goes to the next strand; otherwise, he repeats the needed exercises. The documentation for this set includes complete descriptions and run instructions for each exercise in each strand. It also includes sample record sheets which may be duplicated by the teacher so that each student may keep his own record of dates and scores for the exercises he has done. Suggested for grades 5-9. Apple disk, TRS-80 disk or cassette $329.00.

2. GATHERING SPEED-SET 1 - NTS. Five programs. "Powers and Roots" includes four lessons: raising to a power, raising to a power and multiplying, raising to a power and adding or subtracting, and finding square roots (from perfect squares.) Large graphic numerals allow proper representation of exponents. "Perimeters, Areas and Volumes" includes eleven lessons: perimeters of rectangles, perimeters of squares, circumference of circles, areas of rectangels, areas of squares, areas of parralellograms, areas of triangles, areas of circles, volumes of rectangular prisms, volumes of cubes, and volumes of cylinders. Some lessons include graphics illustrations. "Factoring" includes three lessons: finding any two factors, finding prime factors, and finding prime factors using exponential notation. Large graphic numerals allow proper representations of exponents. Provisions allowed to show all steps. "Averages" includes two lessons: finding the average of numbers in a set and word problems dealing with the same process. "Ration and Proportion" includes five lessons: writing a ration as a fraction, word problems converting ratios to fractions, finding the missing number in a proportion, finding the missing number in a proportion using larger numbers, and word problems reqiring the student to write and solve a proportion. Suggested for grades 7-9. Apple disk, TRS-80 cassette or disk $169.00.

3. GATHERINC SPEED-SET 2 - NTS. Five programs. "Equivalents" includes six lessons: rename fractions to decimals, rename decimals to fractions, rename percents to decimals, rename percents to fractions, rename decimals to percents, and rename fractions to percents. "Percents" includes nine lessons: finding a percent of a number, using a table of equivalent fractions to find a percent of a number, finding what percent one number is of another, finding what percent one number is of another with more difficult problems, mixed problems from lessons 1 and 3, mixed problems from lessons 1 and 4, word problems involving finding a percent of a number, word problems involving finding what percent one number is of another, and mixed problems from lessons 7 and 8. "Interest: includes three lessons: finding the interest using i-prt with whole numbers for rate and time, with fractional rate, and with fractional time. "Discount, Sales Tax, Commission and Installment Buying" includes eight lessons: rounding to the nearest cent, finding a percent completing a table showing amount of sales tax and price including sales tax, completing a similar table with rounding required, completing a table showing amount of discount and sale price, completing a similar table with rounding required, completing a table showing amount of commission and total earnings, and completing a table concerning installment butying. "Word Problems" includes six lessons: two each on whole numbers, fractions, and decimals. Suggested for grades 7-9. Apple disk, TRS-80 cassette or disk $169.00.

4. MOVING ON-SET 1 - NTS. Five programs. Comprehensive tutorial on fractions giving instruction and practice with the four basic operations as well as renaming equivalent fractions. Includes reducing, addition, subtraction, multiplication and division. Apple disk $179.00.

5. INTRODUCTION TO DECIMALS ON THE COMPUTER - Educational Activities. All four operations, six levels of difficulty. Apple, Pet, TRS-80 cassette $39.95, disk $49.95.

6. MOVING ON-SET 2 - NTS. Five programs. Comprehensive tutorial on decimals, giving instruction and practice with the four basic operations as well as converting among decimals, percents and fractions. Apple disk, TRS-80 cassette or disk $149.00.

7. METRIC SYSTEM TUTOR - E.M.E. Six part program for mastery of the metric system with emphasis upon its logic and simplicity. Optional placement test directs the student to one of four tutor sequences where help may be found. Color graphics enhance comprehension as students work at their own pace. Progress is recorded for evaluation. Test concludes the program. Awarded Second Honors, Texas Instruments Author Program. Study Guide. Apple II disk $66.00, TRS-80 Model I and Model III disk $69.00.

8. PIE AND LINE GRAPHS - Aquarius. Tutorial on the purpose of graphs, their interpretations and construction. Graphs become understandable and fun as they visually come to life via the microcomputer. Reproducible student skill pages are included in the Teacher's Guide to provide students with practice in constructing and interpreting their own graphs.

A student management system is included on each program disk. Apple and TRS-80 disk; $29.95; TRS-80 cassette $24.95.

9. BAR AND PICTURE GRAPHS - Aquarius. Similar to the above. Apple and TRS-80 disk $29.95; TRS-80 cassette $24.95.

10. GRAPH PACKAGE - Aquarius. Both of the above. Apple and TRS-80 disk. $55.00, TRS-80 cassette; $45.00.

11. SOLVING WORD PROBLEMS II - Aquarius. (6th and 7th grade reading level) Tutorial instructs students in the use of step by step procedure for solving word problems. All problems are consistent with the functional literacy basic skills test in mathematics. Problem solving steps are randomized to allow for repeated program use with a unique learning experience each time. Apple and TRS-80 disk $29.95; TRS-80 cassette $24.95.

Apple and Atari

1. FRACTIONS - Edu-Ware Services. Six major skill areas (covering both common fractions and mixed numbers: definitions and parts of the fraction, denominators, addition, subtraction, multiplication and division.) Apple, Atari disk $49.00.

2. DECIMALS - Edu-Ware Services. Pre-test and seven learning modules, thorough indoctrination into use of decimals. Apple, Atari disk $49.00.

Apple, Atari, Commodore, TRS-80

1. ALGEBRAIC EXPRESSIONS - Educational Activities. This program clearly explains the way in which verbal phrases correspond to algebraic expressions as the computer reviews addition, subtraction, multiplication, and division. It also explains the use of the comma (how it assists in the interpretation of a phrase). In the exercise drills, the computer displays a phrase and the student must enter the corresponding algebraic expression. Also offers clear, step-by-step instructive examples to show how the basic variables X and Y function in algebraic expressions and exercises. PET, TRS-80 cassette $39.95. PET TRS-80, Apple, Atari disk $49.95.

2. AREA, PERIMETER, CIRCUMFERENCE AND LINEAR MEASUREMENT - Educational Activities. Apple, Pet, TRS-80, Atari, disk $49.95. PET, TRS-80 cassette $39.90.

3. ADDING FRACTIONS - Microcomputer Workshops. An excellent opportunity is provided in adding fractions with uncommon denominators. All problems are generated randomly. The screen is divided into two segments, the top for the work area and the bottom for messages and instructions. The problem then evolves from left to right. All work is done on the screen.

The student is given the option of changing denominators or adding. If changing denominators, the student goes through the process of entering the least common denominator (LCD) and changing the fraction by multiplying the numerator and denominator. If the student is unable to find the LCD, the program will branch to a section that will explain how the LCD is found. The student completes the addition when the denominators are equal. The program provides for reducing and/or changing to mixed fraction form. All errors are immediately flagged and appropriate explanations given. Apple, TRS-80, PET, Com. 64, Atari disk $24.95, Atari, TRS-80, 16K, Pet8 K, Com. 64 cassette $20.00.

4. MULTIPLYING FRACTIONS - Microcomputer Workshops. Providing practice in multiplying fractions and in canceling or reducing, this superb teaching method focuses on errors as they are made in complex algorithm. The student cannot continue until each step is correct. All problems are generated randomly. The screen is used as a worksheet and is divided into three segments. The top part shows the original problem, the middle part is used as a work area, while the bottom section is used for instructions and error messages. The student is given the option of canceling or multiplying. All work is done on the screen. If canceling, the student enters the numbers to be canceled, which are highlighted in the work area. The student then types in the new values after cancellation. All errors are immediately flagged and appropriate explanations are given. When all cancellations are finished, the student then completes the multiplication. The program provides for changing the fraction to mixed fraction form. Errors are categorized and totals are given at the end of each problem and at the end of the lesson. Apple, TRS-80, PET, Com. 64, Atari disk $24.95, TRS-80 16K, PET 8K, Com. 64, Atari cassette $20.00.

5. GRAPHING - Educational Activities. Two programs. "Introduction" reviews in basic terms such as Coordinate Plane, X and Y axes, origin and ordered pair, provides instruction on writing an ordered pair for a point displayed on a graph. "Plotting" gives the student the opportunity to plot random ordered pairs, designed by the computer, on a Coordinate Plane. Apple, Atari, PET, TRS-80 disk $49.95. PET, TRS-80 cassette $39.95.

6. EQUATIONS - Educational Activities. Three programs which provide the student with an unlimited supply of random equations which s/he must solve for the variable. Step by step display and explanation of how to find the solution are supplied if needed. The first program provides random equations of one variable and one operation. The second provides random equations of one variable and two operations, and frequent use of parentheses. The third provides random equations which include the variable on both sides. Apple, Pet, TRS-80, Atari disk $59.00. PET, TRS-80 cassette $49.00.

7. PERCENTAGES - Educational Activities. Three programs which provide both instruction and reinforcement in solving percent problems. The programs utilize both tutorial and drill formats to develop skill in percent conversion and computation. All problems given are randomly selected by the computer. The first program involves rewriting a decimal as a percent and a percent as a decimal. The second explains and provides practice in rewriting fractions as a percent. The third focuses on finding a percent of a given number. Apple, Pet, TRS-80, Atari disk $59.00. PET, TRS-80 cassette $49.00.

8. FRACTIONS: ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION - Educational Activities. Apple, Pet, TRS-80, Atari disk $49.95. PET, TRS-80 cassette $39.90.

9. DECIMALS AND GRAPHS AND MEAN, MEDIAN AND MODE - Educational Activities. Apple, Pet, TRS-80, Atari disk $49.95. PET, TRS-80 cassette $39.90.

10. CONVERTING FRACTIONS AND PERCENTS AND PERCENT WORD PROBLEMS - Educational Activities. Apple, Pet, TRS-80, Atari disk $49.95. PET, TRS-80, cassette $39.90.

Apple and Commodore

1. ORDER OF OPERATIONS - Microcomputer Workshops. Provides practice in order of operations with addition, subtraction, multiplication, division and parentheses. Option of working with either whole numbers or signed numbers is given. All numbers and operations in the expression are generated randomly and all results are integers. Each expression contains three operations and one set of parentheses. A typical example would be: 3*(8-2)/6. The Student simplifies the expression one step at a time on the screen. All errors are immediately flagged and explained. When the problem has been completed, a summary of the steps in the solution is shown on the screen. PET, Com. 64 cassette $20.00, PET, Com. 64, Apple disk $24.95.

2. INTRODUCTION TO GEOMETRY PACKAGE - Micrograms. Four programs on: Area and Perimeter; Perimeter; Area; and Volume. 4 PET cassettes $51.80, PET disk $54.80. 4 Com. 64 cassettes $59.80, Com. 64 disk $62.80.

3. BASIC MATH TECHNIQUES - Focus Media. Covers significant figures, rounding off, calculations and rounding off (addition and subtraction), and calculations and rounding off (multiplication and division). Apple II, PET disk $72.00, PET 16K cassette $80.00.

4. RECOGNIZING, COMPARING FRACTIONS I and II - Teacher's Pet Software. three programs on translating graphics into fractions, fractions into graphics, identifying the larger or smaller of two fractions. Pet cassettes $21.95.

5. STORY PROBLEM PRACTICE - Micrograms. Six programs on: Averaging; Combinations of all four operations; Area, Perimeter, and Volume; Fractions; Decimals; and Ratio, Proportion, Percent. 6 PET cassettes $12.95 each, 6 PET disks $15.95 each. All 6 PET cassettes or all 6 programs on one PET disk $77.70. 6 Com. 64 cassettes $14.95 each, 6 Com. 64 disks $17.95 each all 6 Com. 64 cassettes, all 6 programs on one Com. 64 disk $89.70.

6. DECIMAL PACKAGE - Micrograms. Seven programs on: Introduction to Decimals; Adding and Subtracting Decimals; Comparing Decimals; Multiplying Decimals; Converting Decimals to Fractions; Converting Fractions to Decimals; and Division with Decimals. 7 PET cassettes $12.95 each, 7 Pet disks $15.95 each. All 7 PET cassettes or all 7 programs on one PET disk $90.65. 7 Com. 64 cassettes or all 6 programs on one Com. 64 disk $104.65.

Algebra (25%)

1. ALGEBRA 1 - Edu-Ware Services. Definitions, number line operations, sets, evaluation expressions and rules for equation reduction. High resolution graphics, upper/lower case text. Flowcharted "information maps" mark the learner's progress by designating concepts learned, those still to be learned and those that were troublesome. The maps also recommend a sequence of follow through the five units. Learners are encouraged to experiment with "learning styles" (cognitive style differentiation) to discover which best suits their needs. Comprehensive documentation ilustrates all procedures and explains the system's instructional model. Apple, Atari disk $39.95.

2. ALGEBRA 2 - Edu-Ware. Rules for Addition; Rules for Multiplication; Solving Equations; and Solving Inequalities. Apple disk $39.95.

3. ALGEBRA 3 - Edu-Ware. Monomials, Polynomials, Simple Factoring, Factoring and Binomials, and Quadratic Trinomials. Apple disk $39.95.

4. ALGEBRA 4 - Edu-Ware. Introduces new material covering Graphing, Linear Equations, Variation, Solving Systems of Linear Equations and Inequalities. Because every individual learns in a slightly different way, ALGEBRA 4 offers a choice of "learning styles" - definitions, rules, examples, and sample problems to solve. The choice gives students the opportunity to discover the most effective methods for gaining information, and to achieve a certain level of self-management in learning. Other features of the system include high resolution graphics, a custom-designed upper/lower case font, and flow-charted information maps - all of which made ALGEBRA 1, 2, and 3 popular among home users and educators alike. ALGEBRA 1, 2, 3, and 4. Apple disks $39.95 each.

5. ALGEBRA DRILL AND PRACTICE I - Conduit. Nine drills on algebraic signs, operations with numeric and algebraic fractions, percents, equations of lines, simplification of algebraic expressions, word problems. The programs provide virtually unlimited example problems and their detailed, step-by-step solutions. Nine drills covering the topics listed above are included. 90 page instructional manual. Apple disk $125.00. Additional Instructor Manual $4.00.

6. ALGEBRA DRILL AND PRACTICE II - Conduit. The programs in this package extend the coverage of algebra topics presented in Algebra Drill and Practice I. Together these packages cover most of the topics included in an elementary algebra course, as well as some pre-algebra topics that beginning students have difficulty mastering. The programs provide supplementary assistance to give students drill, practice, and review of specific algebra topics: decimal arithmetic; absolute numbers; solving equations and inequalities, involving absolute values; simplifying expressions with integral exponents; factoring linear and quadratic expressions, both binomals and trinomials; solving linear algebraic equations; finding roots of quadratic equations, x-intercepts of parabolic graphs, and the vertex of a parabolic graph; and solving linear inequalities. Package includes Instructor's Guide (64 pages) and Apple software on two diskettes, $125.00; Additional Instructor, $3.50.

7. FACTORING ALGEBRAIC EXPRESSIONS - Microcomputer Workshops. Generates algebraic linear and quadratic expressions that are factorable. The computer multiplies the factors entered by the student and shows the result. If unable to factor the expression, the student may ask for help and the program switches to a mode that explains the procedure. Error analysis and explanation. Apple disk $29.95.

8. SIMULATIONS LINEAR EQUATIONS - Microcomputer Workshops. Generates random simultaneous linear equations that are solvable by addition or subtraction. All solutions are integers. The program shows a graphic representation of the solution as the intersection of the two lines representing each equation. Error analysis and explanation.

9. BINOMIAL MULTIPLICATION - Microcomputer Workshops. Provides practice in multiplying two binomials, in the form (ax+b) (cx+d) where a, b, c, and d are integers. If the student is unable to perform the multiplication properly, the FOIL method of binomial multiplication is explained in a tutorial. Error analysis and explanation. Apple disk $24.95.

10. SYMBOLS AND SETS - Intellectual Software. Tutorial on signs of equality and inequality, sets and subsets, number lines, manipulating sets and numberlines, order of operations, factors, coefficients, exponents, negative numbers. Review test. Available November 1983. Apple disk $39.95.

11. REAL NUMBER SYSTEM - Intellectual Software. Tutorial on addition, subtraction, multiplication, division, factoring, reducing: negative numbers, rational and irrational numbers, powers, and roots. Available November 1983. Apple disk $39.95.

12. EQUATIONS I - Intellectual Software. Tutorial on algebraic expressions, equalities and inequalities, and solving equations with one and two unknowns. Available November 1983. Apple disk $39.95.

13. EQUATIONS II - Intellectual Software. More advanced version of the above including quadratics. Available November, 1983. Apple disk $39.95.

14. ALGEBRA WORD PROBLEMS - Intellectual Software. Mathematical problems presented which require algebraic solutions. Each wrong answer draws a step by step explanation. Ten programs on one disk graded in difficulty. Available November, 1983. Apple disk $49.95.

15. PRACTICAL ALGEBRA SERIES - Intellectual Software. All five of the above Apple disk $195.00. Available November, 1983.

16. EQUATIONS - Educational Activities. Three programs which provide the student with an unlimited supply of random equations which s/he must solve for the variable. Step by step display and explanation of how to find the solution are supplied if needed. The first program provides random equations of one variable and one operation. The second provides random equations of one variable and two operations, and frequent use of parentheses. The third provides random equations which include the variable on both sides. Apple, Pet, TRS-80, Atari disk $59.00. PET TRS-80 cassette, $49.00.

17. EQUATIONS - Microcomputer Workshops. Equations are generated randomly in the form AX + B = C, where A, B, and C are integers. All solutions are integer values. Students solve the equations step-by-step on the screen. After each step, the equation is updated. All errors, including the incorrect use of algebraic axioms, are immediately flagged and appropriate messages are given explaining the student's error. The student then continues solving the equation until reaching the correct solution. PET, COM.64, TRS-80 cassette $20.00, Apple, PET, Com. 64, TRS-80 disk $24.95.

18. SOLVING QUADRATIC EQUATIONS - Microcomputer Workshops. The motivator is success as the student progresses through this excellent program which provides step-by-step reinforcement while generating random quadratic equations in the form AX2 + BX + C = 0 that are solvable by factoring. The student solves the equation by factoring the quadratic expression, setting both factors equal to zero and solving the resultant equations for all values of X. If the student is unable to factor the quadratic expression, a detailed explanation of the factoring process is given for that particular problem. The screen is used as a worksheet and the student interacts with the computer as the problem progresses. All work is done on the screen. Errors are immediately flagged and an appropriate response explaining the error is given. PET, TRS-80, Com. 64, cassette $20.00, Apple, PET, TRS-80, Com. 64 32K disk $24.95.

19. EVALUATION OF EXPRESSIONS - Redcomp. The following kinds of problems are presented: Find the value of AX + Y = B, Given A, X, Y. Combine terms: AX + BX + CX + D(X+E), Given A, B, C, D, E. Solve for X: AX + B = CX, Given A, B, C, and D. Apple, TRS-80 disk $29.95, TRS-80 cassette $22.95.

20. FACTORING QUADRATIC EXPRESSIONS - Redcomp. The basic level presents problems for which the coefficient of the quadratic term is one; the advanced level is not restricted. Examples are provided, if requested. After 3 tries, the answer is given and a suitable example is presented. Apple, TRS-80 disk $29.95. TRS-80 cassette $22.95.

21. ALGEBRA - Tycom. This series of programs will assist the student with various topics of Algebra, including set operations, arithmetic operations with signed numbers, addition and multiplication of binomial expressions, solving linear equations, and factoring quadratic expressions. A lesson explaining each type of problem is given, followed by randomly generated problems to be solved by the student. Seven programs, available on a single cassette tape, or as a set of seven individual tapes. The individual tapes are useful in a multiple computer environment, and reduce load times for most programs. 1 Pet cassette, $19.95, 7 cassettes $29.95.

22. MORE ALGEBRA - Tycom. Topics presented include slope of a line, distance between points, solving pairs of simultaneous equations, solving quadratic equations by factoring, the use of the discriminant, and solving for complex roots using the quadratic formula. Five programs, available on a single cassette tape, or as a set of five individual tapes. All five programs on a single Pet cassette $19.95, Set of five tapes $26.95.

23. ALGEBRA WORD PROBLEMS - Tycom. The student is led step by step through a logical problem-solving technique, and is asked several multiple-choice questions along the way. Problem types include consecutive integers, age problems, perimeters, perimeters of triangles and rectangles, sums and differences, multiples, and areas of rectangles. Students using this program should already know how to solve linear equations in one variable. The emphasis of this program is in interpreting word problems and setting up correct equations. PET/CBM 40 or 80 column machine with at least 16K. A somewhat abbreviated verson is also included which will run on all 8K machines. Specify machine. $19.95.

Geometry (20%)

1. LINES AND ANGLES - Intellectual Software. Tutorials and drills on points, lines, surface, straight line segments, right angles, supplementary angles, complementary angles, angle bisectors. Theorems on angles and perpendicular lines, angles and intersecting lines, angles and parallel lines. Available November, 1983. Two Apple disks $65.00.

2. TRIANGLES - Intellectual Software. Tutorials and drills on areas of triangles, on congruent triangles, right, isosceles and equilateral triangles, Pythagorean theorem, special right triangles, angles within and outside triangles. Available November, 1983. Two Apple disks $65.00.

3. CIRCLES - Intellectual Software. Tutorials and drills on area, perimeter, arcs, angles, tangents. Available November, 1983. Apple disk $35.00.

4. QUADRILATERALS, POLYGONS AND SOLID GEOMETRY - Intellectual Software. Tutorials and drills on area and perimeter of square, rectangle parallegram, rhombus, trapezoid, polygons. Volumes of solid figures, line relationships, sum of angles, ratios of lines and areas, areas of combination figures. Available November, 1983. Apple disk $35.00.

5. THEOREMS AND PROOFS OF THEOREMS - Intellectual Software. Step by step presentation and analysis of 16 important theorems, converse and inverse theorems. Available November,1983. Apple disk $45.00.

6. PRACTICAL GEOMETRY SERIES - Intellectual Software. All 5 of the above, 7 Apple disks $195.00.

7. GRAPHING - Educational Activities. Two programs. "Introduction" reviews in basic terms such as Coordinate Plane, X an Y axes, origin and ordered pair, provides instruction on writing an ordered pair for a point displayed on a graph. "Plotting" gives the student the opportunity to plot random ordered pairs, designed by the computer, on a Coordinate Plane. PET, TRS-80 cassette$39.95. Apple, Pet, TRS-80, Atari disk $49.95.

8. MASTER MATH 3 Areas and Volumes - PMI. The first four programs are visual lessons for class demonstration (using High-Resolution Graphics and extra-large letters) Lesson 1 is on the areas of squares, rectangles and triangles of any shape. Lesson2 is on the areas of parallelograms, trapezoids and circles and circumference of circles. Lesson 3 is on the length of circular arcs, area of sectors and volume and surface areas of cylinders, cubes, prisms, cones and pyramids. Test Problems 1 - Problems on areas of squares, rectangles and triangles. Test Problems2 - Problems on circumference and area of circles. Test Problems 3 - Problems on arc lengths and areas of sectors. Test Problems 4 - Problems on volume of cones and surface area of cylinders. Apple, PET, CBM 8032 disk. $30.00.

9. REDCOMP GEOMETRY PACKAGE - Redcomp. Includes: Area & Volumes. Problems are in two levels: elementary and advanced. Areas of squares, rectangles, rhombuses, triangles of several kinds, trapezoids, and hexagons, as well as areas of regions composed of regular shapes, cubes, rectangular solids, pyramids, cones, and cylinders. Distance Formula - Midpoints. Drill on finding the midpoint and the length of a line segment. The user is given the coordinates of two points and told to find the midpoint. Slope. Given the coordinates of two points or the equation of a line, practice finding slopes. Trapezoidal Areas. Objectives: to provide practice with finding trapezoidal length, base, altitude and area. However, these are not simply "plug in" problems. Example: If a square with a diagonal of length 12 has the same area as a trapezoid with height 10 and one base 4, find the other base of the trapezoid. 10 different kinds of questions. Apple, TRS-80 cassette or diskette $89.95.

Miscellaneous

*1. HIGH SCHOOL MATH COMPETENCY SERIES - Microcomputer Workshops. Drill and remediation in the basic skills of mathematics. The program content is based on the New York State curriculum guidelines for competency in mathematics. The fourteen subprograms contained on this disk are: Whole Integers, Algebra, Geometry, Ratio and Proportion, Probability, Statistics, Percent Word Problems, Money Problems, and Miscellaneous Problems. Model III TRS-80 32K disk $99.00.

2. MASTER MATH 4 - EXAMS - PMI. Contains 12 programs on 26 topics. It includes Test Problems on 1. Factoring of Algebraic equations 2. Simple and Compound interest 3. Statistics I 4. Trigonometry (problems using sin, cos and tan rules), 5. Differentiation (Calculus) 6. Solution of triangles using sine and cosine formulas 7. Percentages 8. Changing bases of numbers 9. Indices on Algebra I 10. Similar Triangles 11. Applications of Pythagoras' Theorem and 12. Profit and Loss. Apple, PET, CBM 8032, 3 Vic 20, Timex Sinclair 1000, 2000 cassettes. $30.00.

3. MASTER MATH 5 - EXAMS - PMI. Contains 12 programs on 33 topics. It includes Test Problems on 1. Simplification of bracketed quantities in Algebra, 2. Ratio and Proportion, 3. Polygon Properties, 4. Graphs of linear and quadratic functions, 5. Statistics II, 6. Solution of Algebraic Equations, 7. Vectors, 8. Indices II, 9. Geometry of the circle and its chords, 10. Matrices, 11. Operations on numbers in different bases and 12. Simultaneous Equations. Apple, PET, CBM 8032 disk, 3 Vic 20, Timex Sinclair 1000, 2000 cassettes. $30.00.

4. MASTER MATH 6 - EXAMS - PMI. Contains 7 programs on 20 topics including 1. Geometry of the straight line and triangle (applications of the rules concerning angles in a straight line, vertically opposite, acute and obtuse, alternate, coordinates , and interior and exterior angles of a triangle), 2. Lowest Common Multiple, 3. Functions as Mappings (simple and compound, linear and quadratic), 4. Fractions (addition, subtraction, multiplication and division), 5. Congruent Triangles, 6. Algebraic Fractions (simplification, addition and subtraction using two types of functions), and 7. Currency Conversion. Apple, PET, CBM disk $30.00.

5. SENIOR HIGH MATH I - Microphys. 13 programs on verbal problems, geometry, trigonometry. Apple, Pet, Com. 64, TRS-80, IBM PC disk $200.00.

6. SENIOR HIGH MATH II - Microphys. 12 Programs on verbal problems, arithmetic and geometric programming, etc. Apple, Pet, Com. 64, TRS-80 IBM PC disk $200.00.

7. MICRO MATH MAGIC - Deegan Learning Materials. Courseware series instructs students in basic math, decimals, rounding, fractions, making change, geometry, and word problems. Reinforces immediately, gives score and time taken to solve problem. Apple disks $32.95 each, Set of 12 $395.40.

Appendix 1 - Choices for a Limited Budget - By Computer Model

Apple

Total: $3566.40

TEST 1 - Writing Skills

1. SPELLING MACHINE - Southwest Ed Psych Services. $49.95.

*2. PRACTICAL SPELLING - Intellectual Software. 2 disks $39.95, with classroom management system, $59.95.

3. PUNCTUATION REVIEW - Intellectual Software. $19.95.

4. CAPITALIZATION PLUS - Microcomputer Workshops. $39.95.

*5. ENGLISH ACHIEVEMENT I-V - Microcomputer Workshops. $175.00.

6. COMPREHENSIVE REVIEW PART II - Intellectual Software. $34.95 with classroom management system $44.95.

7. SUBJECT-VERB AGREEMENT PLUS - Microcomputer Workshops $39.95.

*8. PRACTICAL COMPOSITION II: LOGICAL, CLEAR SENTENCES - Intellectual Software. $29.95, with classroom management system $39.95.

*9. PRACTICAL COMPOSITION III: EFFECTIVE ORGANIZATION - Intellectual Software. $29.95, with classroom management system $39.95.

TEST 2 - Social Studies

1. ECONOMICS: WHAT, HOW AND FOR WHOM? - Focus Media. 4 disks $159.00.

2. U.S. CONSTITUTION TUTOR - Micro Lab Learning Center. $30.00

3. GOVERNMENT - Academic Hallmarks. $27.00.

4. AMERICAN GOVERNMENT SERIES - Intellectual Software. $150.00

5. THE U.S. CONSTITUTION: NATIONALISM AND FEDERALISM - Focus Media $159.00.

6. AMERICAN HISTORY #1 - Academic Hallmarks $27.00.

7. AMERICAN HISTORY #2 - Academic Hallmarks $27.00

8. GEOGRAPHY SERIES - Academic Hallmakrs. $63.00.

9. PSYCHOLOGY - Academic Hallmarks $27.00.

TEST 3 - Science

1. THE EAR - Micro Power & Light. $24.95.

2. CIRCULATION - Micro Power & Light. $59.90.

3. REPRODUCATION - Micro Power & Light. $59.90.

4. THE HEART - Avant Garde. $29.95.

5. THE DIGESTIVE SYSTEM - Avant Garde. $29.95.

6. HI RES BIOLOGY - J & S Software. $250.00.

7. GENETICS - Microcomputer Workshops. $24.95.

8. CHEMISTRY - J & S Software. $250.00.

9. CHEMISTRY #1 - Academic Hallmarks. $27.00.

10. CHEMISTRY #2 - Academic Hallmarks. $27.00.

11. EARTH SCIENCE SERIES - Academic Hallmarks. $84.00.

12. PHYSICS #1 - Academic Hallmarks. $27.00.

13. PHYSICS #2 - Academic Hallmarks. $27.00.

14. PHYSICAL SCIENCE PROGRAMS - J & S. $250.00

TEST 4 - Reading Skills

*1. PAL - Universal Systems for Educational Inc. Master disk $99.95. Reading packages, grades 5-6, $99.95 each.

2. PHRASE READING I - Creative Curriculum. $49.95.

3. PHRASE READING II - Creative Curriculum. $59.95.

4. READING COMPREHENSION I - Milton Bradley. $49.95.

5. ADVANCED READING COMPREHENSION - Intellectual Software. $65.00, with management system, $85.00.

TEST 5 - Mathematics

1. MATHEMATICS GRADE 6 - Intellectual Software. 4 Apple disks, $79.95, with classroom management system, $119.00.

2. MATHEMATICS WORD PROBLEMS GRADES 6-8 - Intellectual Software. $175.00.

3. PROBLEM SOLVING COMPUTER TUTOR - RG Computer Workshops. $74.95.

4. DECIMAL SKILLS - Milton Bradley. Apple disk $49.95.
5. RATIOS AND PROPORTIONS - Milton Bradley. Apple disk $49.95.
6. PERCENTS - Milton Bradley. $49.95.
7. GENERAL MATH - Academic Hallmarks. $27.00.
8. WORD PROBLEMS - Academic Hallmarks. $27.00.
9. DIVIDING FRACTIONS - Microcomputer Workshops. $24.95.
10. ADDING DECIMALS - Microcomputer Workshops. $24.95.
11. SUBTRACTING DECIMALS - Microcomputer Workshops. $24.95.
12. MULTIPLYING DECIMALS - Microcomputer Workshops. $24.95.
13. DIVIDING DECIMALS - Microcomputer Workshops. $24.95.
14. TAKING INVENTORY - NTS. $329.00.
15. ALGEBRA DRILL AND PRACTICE I - Conduit. $125.00.
16. ALGEBRA DRILL AND PRACTICE II - Conduit. $125.00.
17. FACTORING ALGEBRAIC EXPRESSIONS - Microcomputer Workshops. $29.95.
18. SIMULTANEOUS LINEAR EQUATIONS - Microcomputer Workshops. $29.95.
19. BINOMIAL MULTIPLICATION - Microcomputer Workshops. $24.95.
20. PRACTICAL ALGEBRA SERIES - Intellectual Software. $195.00.
21. PRACTICAL GEOMETRY SERIES - Intellectual Software. $195.00.

Atari

Total: Cassettes $228.80. Disks $833.70 (Also see COMMODORE and MISCELLANEOUS)

TEST 1 - Writing Skills

1. SPELLING BUILDER - Program Design Inc., Cassette $19.95, Disk $26.95.
2. PUNCTUATION I - Educational Activities. Disk $59.00.
3. PUNCTUATION II - Educational Activities. Disk $59.00.
4. CAPITALIZATION - Educational Activities. Disk $59.00.
5. LANGUAGE LAB DRILL KIT 2 - Bluestone. Disk or cassette, 16K. $25.00.

TEST 2 - Social Studies

1. U.S. HISTORY - Dorsett. Cassettes $77.00.

2. SOCIAL STUDIES PACKAGE - Demi-Software. Cassettes $29.85.

3. REGIONS OF THE UNITED STATES - Educational Activities. Disk. $59.00.

4. ECONOMICS - Dorsett. Cassettes $77.00.

TEST 3 - Science

1. PHYSICS - ELEMENTARY MECHANICS - PLATO. Disk $70.00.

TEST 4 - Mathematics

1. FRACTIONS - Edu-Ware Services. Disk $49.00.

2. DECIMALS - Edu-Ware Services. Disk $49.00.

3. ALGEBRA 1 - Edu-Ware Services. Disk $39.95.

4. GRAPHING - Educational Activities. Disk $49.95.

5. EQUATIONS - Educational Activities. Disk $59.00.

6. PERCENTAGES - Educational Activities. Disk $59.00.

7. FRACTIONS: ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION - Educational Activities. Disk $49.95.

8. DECIMALS AND GRAPHS AND MEAN, MEDIAN AND MODE - Educational Activities. Disk $49.95.

9. CONVERTING FRACTIONS AND PERCENTS AND PERCENT WORD PROBLEMS - Educational Activities. Disk. $49.95.

TRS-80

Total: Cassettes, $1167.75; Disks $2603.85 (Also see COMMODORE and MISCELLANEOUS)

TEST 1 - Writing Skills

*1. SPELLING BREAKTHROUGH - EMC. Disks $96.00.

2. PUNCTUATION & CAPITALIZATION - Bertamax. Disk $79.00, cassettes $91.00.

3. ENGLISH ACHIEVEMENT I - Microcomputer Workshops. Disk $39.95.

4. COLLEGE ENGLISH I - GRAMMAR - Intellectual Software. Disk $105.00.

5. COLLEGE ENGLISH II - COMPOSITION - Intellectual Software. Disk $165.00.

TEST 2 - Social Studies

1. ECONOMICS: WHAT, HOW, AND FOR WHOM? - Focus Media. 4 disks $159.00.

2. U.S. HISTORY - Dorsett. Cassettes $59.00.

3. SOCIAL STUDIES PACKAGE - Demi-Software. Cassettes $29.85.

4. THE U.S. CONSTITUTION: NATIONALISM AND FEDERALISM - Focus Media. Disk $159.00.

5. REGIONS OF THE UNITED STATES - Educational Activities. Disk. $59.00.

6. ECONOMICS - Dorsett. Cassettes $59.90.

TEST 3 - Science

1. HI RES BIOLOGY - J & S Software. Disks $250.00

2. TYC BIOLOGY PACKAGE - TYC Software. Cassettes $89.70, disk $99.70.

3. CHEMISTRY - J & S Software. Disks $250.00, 15 cassettes $185.00.

4. COMPOUND ID, MASS, MOLES - Redcomp. Cassette $22.95 disk $29.95.

5. MOLECULAR WEIGHTS & COMPOUND RECOGNITION - Redcomp. Cassette $22.95, disk $29.95.

6. EARTH SCIENCE SERIES - TYC. Disks $78.50. cassettes $68.50.

TEST 4 - Reading Skills

1. READING SKILLS LAB Grade Levels 7-9 - NTS Disks $350.00.

TEST 5 - Mathematics

*1. HIGH SCHOOL MATH COMPETENCY SERIES - Microcomputer Workshops. MODEL III TRS-80 32K disk $99.00.

2. TAKING INVENTORY - NTS. Disk or cassette $329.00.

3. GRAPH PACKAGE - Aquarius. Disk $55.00, cassette $45.00.

4. SOLVING WORD PROBLEMS II - Aquarius. Disk $29.95; cassette $24.95.

5. REDCOMP GEOMETRY PACKAGE - Redcomp. Cassette or diskette $89.95.

6. EVALUATION OF EXPRESSIONS - Redcomp. Cassette $22.95, Disk $29.95.

7. FACTORING QUADRATIC EXPRESSIONS - Redcomp. Cassette $22.95, Disk $29.95.

IBM - PC

Total: $729.75 (Also see COMMODORE and MISCELLANEOUS)

TEST 1 - Writing SKills

1. SPELBOUND - Blythe Valley. $79.95.

2. ENGLISH ACHIEVEMENT I-V - Microcomputer Workshops. $175.00.

3. COLLEGE ENGLISH I- GRAMMAR - Intellectual Software. $105.00.

4. COLLEGE ENGLISH II - COMPOSITION - Intellectual Software. $165.00.

TEST 2 - Social Studies

1. MACROECONOMICS I - Intellectual Software. $34.95.

2. MACROECONOMICS II - Intellectual Software. $34.95.

3. MICROECONOMICS I - Intellectual Software. $34.95.

4. MICROECONOMICS II - Intellectual Software. $34.95.

TEST 4 - Reading Skills

1. READING COMPREHESION GRADE SIX - Intellectual Software. $65.00.

2. THE SPEED READER II - Davidson & Associates. $69.95.

3. ADVANCED READING COMPREHENSION - Intellectual Software. $65.00.

COMMODORE and MISCELLANEOUS

Total: Depends on computer.

TEST I - Writing Skills

1. SPELLING SERIES (Grade 5 and 6) - Micro Ed. Apple, Atari, PET, 32K TRS-80 Color and Model III disks, Com. 64, VIC-20 5K, TI 99/4 cassette or disk $99.90.

2. PUNCTUATION SERIES - Micro Ed. 8 programs - Apple, Atari, PET, VIC-20 8K, TI 99/4 Extended Basic, 32K TRS 80 Color and Model III disks, Com. 64 cassettes or disk $56.00.

*3. USAGE BONERS - Micro Ed. Apple, Atari, 32K TRS-80 Color and Model III disks, VIC-20 5K cassettes; PET, Com. 64 TI 99/4 Extended Basic cassettes or disks $99.00.

4. WORD DEMONS - Micro Ed. PET, COM. 64 cassette or disk $39.75.

*5. ENGLISH ACHIEVEMENT I-V - Microcomputer Workshops. PET cassette $100.00, PET 32K disk $124.75.

TEST 2 - Social Studies

1. COUNTRIES AND CAPITALS - Micro Learningware. Apple, TRS-80 I or III, Radio Shack Color, PET, Com.64 and IBM disk $29.95. TRS-80, Radio Shack.

2. REGIONS OF THE UNITED STATES - Educational Activities. Disk $59.00.

3. STATES-CAPITALS - DES. Comm. 64 cassette $18.00.

TEST 3 - Science

1. PHYSICS I - Microphys. Apple, Pet, Com.64, IBM PC, TRS-80 disks $200.00.

2. PHYSICS II - Microphys. Apple, Pet, Com.64, IBM PC, TRS-80 disks $200.00.

3. CHEMISTRY SET - Education Curriculum. PET cassettes $105.00, disk $80.00.

TEST 4 - Reading Skills

1. MR. READWELL - GRADES 5-6 PACKAGE - Micrograms. 4 PET cassettes $51.80, PET disk $54.80 4 Com. 64 cassettes $59.80, Com.64 disk $62.80.

2. SEQUENCING SAM - GRADES 5-6 PACKAGE - Micrograms. 4 PET cassettes $51.80, PET disk $54.80, 4 Com.64 cassettes $59.80, Com.64 disk $62.80.

3. PROFESSOR SNEAD - Grade 8-9 - Micrograms. PET cassettes, $38.85, disk $41.85, Com.64 cassettes, $44.85, disk $47.85.

4. COMPUTERIZED SPEED READING AND COMPREHENSION - Abbott Educational Software. 16K Pet cassette $49.95.

5. DESCRIPTIVE READING - Educational Activities. Apple, PET, TRS-80, Atari disk (7) $365.00; PET, TRS-80, Atari cassettes (15) $295.00.

TEST 5 - Mathematics

1. ALGEBRAIC EXPRESSIONS - Educational Activities. PET, TRS-80 cassette $39.95, PET, TRS-80, Apple, Atari disk $49.95.

2. AREA, PERIMETER, CIRCUMFERENCE AND LINEAR MEASUREMENT - Educational Activities. Apple, Pet, TRS-80, Atari, disk $49.95. PET, TRS-80 cassette $39.90.

3. ADDING FRACTIONS - Microcomputer Workshops. Apple, TRS-80, PET, Com.64, Atari disk $24.95, Atari, TRS-80 16K, PET 8K, Com.64 cassette $20.00.

4. MULTIPLYING FRACTIONS - Microcomputer Workshops. Apple, TRS-80 PET, Com.64, Atari disk $24.95, TRS-80 16K, PET 8K, Com.64, Atari cassette $20.00.

5. ORDER OF OPERATIONS - Microcomputer Workshops. PET, Com.64, cassette $20.00, PET, Com.64, Apple Disk $24.95.

6. INTRODUCTION TO GEOMETRY PACKAGE - Micrograms. 4 PET cassettes $51.80, PET disk $54.80 4 Com.64 cassettes $59.80, Com.64 disk $62.80.

7. RECOGNIZING, COMPARING FRACTIONS I and II - Teacher's Pet Software. Pet cassettes $21.95.

8. STORY PROBLEM PRACTICE - Micrograms. 6 PET cassettes $12.95 each, 6 PET disks $15.95 each. All 6 PET cassettes or all 6 programs on one PET disk $77.70. 6 Com. 64 cassettes $14.95 each, 6 Com. 64 disks $17.95 each. all 6 Com. 64 cassettes, all 6 programs on one Com. 64 disk $89.70.

9. DECIMAL PACKAGE - Micrograms. 7 PET cassettes $12.95 each, 7 PET disks $15.95 each. All 7 PET cassettes or all 7 programs on one PET disk $90.65. 7 Com. 64 cassettes $14.95 each, 7 Com. 64 disks $17.95 each. All 7 Com. 64 cassettes or all 6 programs on one Com. 64 disk $104.65.

10. MASTER MATH 4 - EXAMS - PMI. Apple, PET, CBM 8032 disk; 3 Vic 20, Timex Sinclair 1000, 2000 cassettes $30.00.

11. MASTER MATH 5 - EXAMS. PMI Apple, PET, CBM 8032 disk; 3 Vic 20 Timex Sinclair 1000, 2000 cassettes. $30.00.

12. MASTER MATH 6 - EXAMS - PMI. Apple, PET, CBM disk $30.00.

13. SENIOR HIGH MATH I - Microphys. Apple, Pet, Com. 64, TRS-80, IBM PC disk $200.00.

14. SENIOR HIGH MATH II - Microphys. Apple, Pet, Com. 64, TRS-80 IBM PC disk $200.00.

15. MASTER MATH 3 Areas and Volumes - PMI. Apple, PET, CBM 8032 disk. $30.00.

16. ALGEBRA - Tycom. PET cassettes $29.95.

17. MORE ALGEBRA - Tycom. PET cassettes. $26.95.

18. ALGEBRA WORD PROBLEMS - Tycom. PET/CBM cassettes $19.95.

19. EQUATIONS - Microcomputer Workshops. PET, Com.64, TRS-80 cassette $20.00, Apple, PET, Com.64, TRS-80 disk $24.95.

20. SOLVING QUADRATIC EQUATIONS - Microcomputer Workshops. PET, TRS-80, Com.64, cassette $20.00, Apple, PET, TRS-80, Com. 64 32K disk $24.95.

APPENDIX 2 - Recommended ABE Programs

Note: The following programs have been selected from the vast library of educational software available because of their quality and approach. All programs which would insult adults have been eliminated. The emphasis is not on games, graphics, or motivational gimmicks, but on good solid tutorial, with some drill.

Writing Skills

1. BUILDING BETTER SENTENCES/Combining Sentence Parts - Milton Bradley. Recognizing sentence parts, compounding subjects, predicates, and completments. Review drill covers compounding all sentence parts. Apple disk $49.95.

2. BUILDING BETTER SENTENCES/Creating Compound and Complex Sentences - Milton Bradley. Readiness skills, combining simple sentences into compound sentences, compound/complex sentences, adverb clauses, and adjective clauses. Apple disk $49.95.

3. NOUNS: WORDS USED AS NAMES - Intellectual Software. Recognizing nouns, kinds of nouns, capitalization of proper nouns, plurals of nouns. Apple disk $19.95, with classroom management system $29.95.

4. PRONOUNS: SUBSTITUTES FOR NOUNS - Intellectual Software. Recognizing pronouns; kinds of pronouns; personal, interrogative, demonstrative, indefinite, relative, possessive, and adjective pronouns. Apple disk $19.95, with classroom management system. $29.95.

5. VERBS: ACTION AND LINKING VERBS - Intellectual Software. Transitive and intransitive verbs, active and passive verbs, tense of verbs. Apple disk $19.95, with classroom management system $29.95.

6. ADJECTIVES: ADDING NEW IDEAS TO NOUNS AND PRONOUNS - Intellectual Software. Use of adjectives, kinds of adjectives, comparison of adjectives. Apple disk $19.95, with classroom management system $29.95.

7. ADVERBS: MODIFIERS OF VERBS, ADJECTIVES, AND OTHER ADVERBS - Intellectual Software. Forms of adverbs, comparison of adverbs, correct use of adjectives and adverbs. Apple disk $19.95, with classroom management system $29.95.

8. PREPOSITIONS: WORDS THAT SHOW A RELATIONSHIP - Intellectual Software. Commonly used prepositions, the correct use of prepositions. Apple disk $19.95, with classroom management system $29.95.

9. NOUNS/PRONOUNS - Hartley. A comprehensive multi-level program on nouns and pronouns. This disk includes: 1. Recognition of common and proper nouns; 2. Possessives, nouns and pronouns; 3. Noun plurals, both regular and irregular; 4. Identification of pronouns; 5. Identification of pronoun antecedents. The vocabulary in the lessons is controlled to allow for each skill to be presented at different reading levels. Each lesson includes an introductory frame and simple examples. Difficult words and concepts are presented at least twice. Apple disk $32.95.

10. VERB USAGE 1, 2 and 3 - Hartley. Two disks. Each contains 20 lessons and 4 tests on verb usage. Each lesson requires the student to discriminate between the present, past and past participle form of commonly used and misused verbs. These programs were written in response to many requests from teachers whose students needed simple, repetitive work on verbs. Apple disk $49.95.

11. VERBS - Hartley. This disk contains a comprehensive multi-level program on verbs more advanced than Verb Usage 1, 2 and 3. The following categories are included: 1. recognition and identification of verbs; 2. tense of regular and irregular verbs; 3. subject-predicate correspondence; 4. contractions; and 5.correct usage. The vocabulary in the lessons is controlled to allow for each skill to be presented at different reading levels. Each lesson includes an introductory frame followed by a simple example. Difficulty is gradually increased. Apple disk $32.95.

12. MASTERING PARTS OF SPEECH - Sunburst. Ten programs provide individualized diagnostic and remedial aid for students needing assistance in grammar. "Nouns", "Verbs", "Pronouns", "Adjectives", "Adverbs", "Prepositions", and "Conjunctions" test student proficiency in identifying parts of speech and give tutorial help as needed. "Interjections" demonstrates how a word can be used as more than one part of speech. An "Instruction" program explains to students how to enter their responses. "Create Test", enables the teacher to generate and print worksheets and tests. Programs utlilze 154 sentences of varying levels, vocabulary and syntactic structure. (Formerly MECC English Volume 1) Extensive documentation. Apple disk $35.00.

13. INFERENCE - Random House - BLS. Reading level 5-6. Using What, Where, When, How and Why. 4 Apple disks $216.00.

14. SENTENCE PATTERNS - Random House-BLS. Reading level 5-6. Subjects, Verbs, Kinds of Sentences. 4 Apple disks $216.00.

15. LANAGUAGE LAB DRILL KIT 1 - Bluestone. Aimed at intermediate grades 4-8. This covers nouns, verbs, pronouns, adjectives, adverbs capitalization, prefixes, suffixes, synonyms, antonyms, homonyms, contractions, dictionary guide words, compound words, definitions, drills, and includes a record sheet ditto master and 3 ring binder. Atari disk or cassette, 16K $25.00.

16. THE NUTS AND BOLTS - Media Materials. High interest exercises stress the identification of each part of speech as it is used in a sentence. Students work with nouns, pronouns, verbs, prepositions, direct objects, predicate nominatives, and objects of the prepositions, direct objects, predicate nominatives, and objects of the preposition. Duplicating masters, instructor's guide. Apple, TRS-80 Model III disk $39.95.

17. THE GEARS AND COGS - Media Materials. More complex parts of speech are introduced: verb phrases, adjectives, possessive pronouns, adverbs, and conjunctions. To reinforce learning, students receive immediate or frequent feedback so they will know how well they are responding. Duplicating masters, instructor's guide. Apple, TRS-80 Model III disk $39.95.

18. LINK IT ALL TOGETHER - Media Materials. Use of a popular musical theme and the graphic capabilities of computer learning helps to focus student's attention on key elements and prodedures in writing correct sentences. After reviewing major rules, high-lighted in boxes, students receive hands-on practice with common sentence patterns, tense and punctuation. Duplicating masters, instructor's guide. Apple TRS-80 Model III disk $39.95.

19. SENTENCE HELPERS - Media Materials. Auxiliary verbs, commonly-used verbals, negative words, and compound elements in sentences are studied in these computer-assisted lessons. Students are encouraged to add variety and interest to their writing. Well-paced exercises helps slower students learn at their own pace. Duplicating masters, instructor's guide. Apple, TRS-80 Model III disk $39.95.

20. COMPOUND? COMPLEX? - Media Materials. Taking advantage of key features of computerized learning, students can watch two simple sentences being combined and revised to produce a compound or complex sentence. Other motivating lessons focus on adverb and adjective clauses, and the use of direct and indirect quotations. Duplicating masters, instructor's guide. Apple, TRS-80 Model III disk $39.95.

21. PUNCTUATION - THE SENTENCE ROAD MAP - Media Materials. After reviewing simple ending punctuation, students work with capitalization, abbreviations, commas, and apostrophes. Helpful examples also advise on avoiding run-on sentences and sentence fragments. Duplicating masters, instructor's guide. Apple, TRS-80 Model III disk $39.95.

22. FINAL ASSEMBLY - Media Materials. Narrative, descriptive, and expository paragraph formats are presented using high-intersst subjects. The objective of the program stresses the writing of clear topic sentences with relevant and specific supporting paragrpahs. Duplicating masters, instructor's guide. Apple, TRS-80 Model III disk $39.95.

23. ESSENTIAL WRITTEN EXPRESSION SERIES - Media Materials. All 7 of the above. Apple, TRS-80 Model III disks $279.65.

24. TEACHERS' FRIEND - The Soft Spot. Teachers' Friend consists of 80 lessons. Each 10-15 minute lesson is a short series of video-text screens that helps students acquire language and grammar concepts. Each lesson uses an interesting format of personal, direct, and natural language. And this non-threatening, student-controlled text is immediately followed by a 12-item non-punitive, self-correcting drill and practice reinforcement sesson. Students do not have to know how to type. The lessons have six question formats: completion, multiple choice, true/false, sequence, matching, analogy. And they reinforce such valuable skills as identification, ordering, perceiving cause and effect, predicting outcomes, drawing conclusions, making generalizations, developing vocabulary, and more. There are two lessons to a disk, two disks to a module. There are 20 modules (2 Apple disk each) available at $60.00 each. The Modlues are: 1. Demonstratives+ 'to be' (present tense), This/That is - These/Those are, Simple Yes/No Questions and Answers Is This/That? - Are These/Those?, Question Words - What? Where? When?, Ordinal Sequence - (first-fourth); 2. Simple Present Tense - 'to be' Let's + Infinitive Contractions - I'm, Your're There's..., Informative Questions: You are - Area You? Why? Because...; 3. Prepositions/Position words: in, on, under, here, there, etc. 4. Present Progressive Tense Prepositions - with, from, to across, Family Terms, Possessive Apostrophe - 's (singular); 5. Simple Present and Present Present Progressive tenses Count/Non Count Nouns Prepositions: in, on, under; 6. Simple Present Tense (regular verbs) Names of: Days, Months, Seasons, Holidays; 7. Simple Past Tense - (regular verbs); 8. Simple Past Tense - (regular verbs) (irregular verbs) Review: Days of the Week; 9. The Simple Past Tense (regular verbs) (irregular verbs) Review: Seasons/Months, Next Week/Month/Year, Last Week/Month/Year; 10. Possessives: Pronouns Adjectives Apostrophe Review: Family Terms; 11. The Past Progressive Tense; 12. Verb Tense Review: The Simple Present Tense, The Present Progressive Tense, The Simple Past Tense, The Past Progressive Tense, Reivew: Possessive Pronoun;Adjectives; 13. The Simple Future Tense; 14. The Future Tenses: We Will + Infinitive, We are going to + Infinitive, We plan to + Infinitive, We hope to + Infinitive, We are going to + Infinitive; 15. Adjectives; 16. Adverbs; 17. The Future Progressive Tense; 18. Modals: Can/Could, May/Might, Should/Ought, Must/Have to; 19. The Present Perfect Tense - (Regular and Irregualr Verbs), The Past Perfect Tense (Regular and Irregular Verbs); 20. The Present Perfect Progressive Tense (Regular and Irregular Verbs), The Past Perfect Progressive Tense (Regular and Irregular Tense), Verb Tenses Together. Each 2 disk module, Apple $60.00.

25. ENGLISH AS A SECOND LANGUAGE - Dorsett. 32 programs on 16 cassettes with common words, stories, etc. Atari cassettes (require Educational Master System Cartridge,) $119.80, TRS Color Computer cassettes $119.80, with study booklets, 32 pre-post tests and mster $159.80.

Social Studies

U.S. History

1. AMERICAN HISTORY - Educational Courseware. Quizzes on Colonial period, Presidents, Wars, National Expansion (statehood), and Court Decisions. Program is modifiable, so that you can create your own lessons. Apple disk $36.00.

2. AMERICA'S HERITAGE - Aquarius. Six programs designed to promote student's appreciation of the people and events that shaped the development of the United States. Instructional emphasis is on the development of the historical concept, and understanding of the geography involved, and vocabulary enrichment. Student's knowledge of the historical concepts presented is evaluated periodically throughout the lesson and in separate testing sections. Test results are recorded in a student management system. The series is accompanied by a Teacher's Guide with suggested follow-up activities. Programs are "Jamestown, An Early Settlement," and "The Struggle For Independence", Apple, TRS-80 Model III disks, $29.95 each.

3. MEET THE PRESIDENTS - Versa Computing. Questions that test the student's knowledge acoompany a portrait of each president drawn by artist Saul Bernsetin. Questions can be changed by the teacher to include any subject matter. Apple disk $39.95.

Geography

1. THE STATES - Orange Cherry Media. Gives the state's locations and their capitals. General facts and information abouth the United States are also included with questions. Apple disk. $30.00.

2. GLOBE MASTER II - Versa Computing. Nine full color maps aid in teaching lessons of geography. Questions cover all continents. Choose any one of nine subjects. Apple disk $39.95.

3. PROFESSOR GEOG (SERIES A) - Alpha. The user may choose from six different programs on this disk: three drills on U.S. geography, one on world capitals, one on geographic terms. Apple disk $24.95.

4. SMALL TOWN, USA - Island Software. The student learns to use a map of a small town, recognizing building symbols and determine distance between buildings by counting blocks. S/he will also learn the various activities associated with each building such as the pharmacy, library, hardware store, etc. Apple disk $25.00; 16 K PET cassette $20.00.

5. U.S. CITIES - Island Software. The student learns to use a map of the contiguous United States. The cardinal and secondary directions are stressed as well as the coordinate locations of major cities. Apple disk $25.00; 16K PET cassette $20.00.

6. U.S. MAP - Island Software. A huge map of the United States is used with all the states clearly outlined and labeled. The student may use the program three ways: to review the names of the states, to test knowledge of the state names and to attempt the "Tour Puzzles". Apple disk $25.00; 16K PET cassette $20.00.

7. MAP READING - Aquarius. Tutorial on roadmaps using a problem solving approach. Apple, TRS-80 disk, $29.95, TRS-80 cassette $24.95.

8. U.S. GEOGRAPHY MASTER - Windcrest. A set of two educational game programs that feature continental U.S. cities, states and capitals. "Region Master" includes detailed maps on which players must identify states and their major cities. "USA MASTER" displays a map of the U.S. with flashing dots that players must identify by city name, indicating whether or not it is a state capital. Each incorrect answer causes the program to respond with the correct answer. Advanced string-packing techniques create excellent graphic maps. Apple, TRS-80 Model I or III disk $24.95, TRS-80 Model I or III cassette $19.95.

9. OUR 50 STATES - Micrograms. Important facts and interesting information are included in this quiz show format which accommodates two contestants. Points are scored for correct answers. When incorrect, the opposing player is given the opportunity to score on the same question. Close attention pays off. We recommend this program for grades 4 and up. PET 16K cassette $12.95, disk $15.95, Com. 64 cassette $14.95 disk $17.95.

10. CANADA - Micrograms. A multiple choice format is used to quiz two players on facts about Canada. If an incorrect response if given, the opposing player is given the opportunity to answer the same question for a lower point value. Information on capitals, major cities, climate, landforms, natural resources, products, famous sons and daughters, and history is included. We recommend this program for grades 4 and up. PET 16K cassette $12.95, disk $15.95, Com. 64 cassette $14.95, disk $17.95.

11. THE WORLD TRAVELER: GEOGRAPHY DRILLS - Sunburst. Grades 5-8. (Formerly MECC Geography.) Four popular MECC programs give students a global perspective by testing and reinforcing knowledge of states, countries, capitals and continents. Supplementary activities and worksheets extend student's understanding through drawing and research projects. Apple disk $30.00.

12. MAPS AND GLOBES - Micro Ed. This maps and globes series is designed to be used directly with the booklet, Skills for Understanding Maps and Globes, by Kenneth Job and Lois Wolf (Follet Publishing Company.)

Each program in this series works as follows: The student brings the booklet to the computer, loads the program and begins the lesson. The computer now poses questions to the student concerning the subject matter in the booklet. The student is free to use the booklet inorder to respond to questions from the computer. For example, the computer may refer the learner to a map on a particular page and ask questions about the specific symbols being used. The computer thus becomes a sophisticated response device, providing immediate feedback to the student, keeping track of student progress and so on. Each tape covers one chapter in the booklet. Apple, Atari 16K, 32K TRS-80 Color and Model III disks, 19 VIC-20 5K cassettes; Pet, COM.64, TI 99/4 Extended Basic cassettes or disk $136.00.

Science

1. WEATHER FRONTS - TYC Software. An introduction to the concepts of weather fronts, their structure and nature. Concepts presented include front characteristics, frontal movement and the weather associated with different kinds of fronts. Color cross-sectional diagrams illustrate cold, warm and occulded frontal structures. Apple disk $24.95.

2. SHORE FEATURE - TYC Software. Features of the shore/beach area of the coast: i.e. berm, dunes, backshore, foreshore, low/high tide marks, low tide terrace, off shore area, trough and bar. Apple disk $24.95.

3. INTRODUCATION TO WEATHER CHART - Avant Garde/Z.E.S. Introduction to weather charts, air masses, pressure zones, synoptic charts. Detailed graphics. Apple disk $29.95.

4. STREAMS AND RIVERS - Aquarius. Tutorial with graphics. Apple, $29.95.

5. THE OCEANS - Aquarius. Tutorial with graphics. Apple $29.95.

6. OUR UNIVERSE - Aquarius. All four of the above. Apple, $115.00.

7. EXPLORING SCIENCE I - Intellectual Software. Second to third grade level. Tutorial and drill on varius science topics. The programs, which will be available in December, 1983 are: 1. Dinosaurs; 2. The Weather; 3. Sharks and Whales; 4. Monkeys, Apes, and Gorillas; 5. Australian, African, and Asian Animals; 6. Snakes and Reptiles; 7. North American Animals; 8. Farm Animals; 9. Rodents; 10. Ocean Mammals; 11. Stars and Planets; and 12. The Earth's Movement - Seasons, Time Zones, Tides, eclipses, Days and Nights. Apple, IBM PC disks $24.95 each, Apple disks with classroom management system $34.95 each.

8. EXPLORING SCIENCE II - Intellectual Software. Similar to above. (Grades 4-5). The programs, which will be available December, 1983 are: 1. Rocks and Minerals; 2. The Ice Age and Glaciers; 3. Earthquakes and Volcanoes; 4. Inventors and Inventions; 5. Birds; 6. Habitats - Desert, Meadow, Field, Forest, Mountain, Marsh, Tundra: Aric and Antarctic (2 disks) 7. Electricity; 8. Elementary Chemistry; 9. Elementary Physics; 10. Introduction to Archaeology; 11. Rockets and Satellites. Apple, IBM PC disks $24.95 each, Apple disks with classroom management system $34.95 each.

9. TEETH - Spectrum. Course on Animal Skulls and Human Teeth in four parts: 1. "Animal Teeth and Dies" contains questions on the three types of animal teeth: incisors, canines, and molars; 2. "Your Own Teeth" teaches students about their own teeth by studying diagrams on the screen; 3. "Take Care of Your Teeth" emphasizes proper dental care; 4. "Review Test" asks 12 questions reviewing the material learned. Includes 6 Skull Study cards and Teacher's Guide. Apple, TRS-80 Model I or III disk, TR-80 Model I or III cassette $38.00.

10. ROCKS - Spectrum. Course on the Properties and Uses of Minerals in four parts. Introduces students to the properties of rocks and allows students to identify rocks by asking questions about their properties. Also explains various uses of rocks. Includes 18 rock samples in plastic storage box, porcelain streak plate, 3 hardness test squares, set of rock labels and Teacher's Guide. Apple, TRS-80 Model I or III disk, TRS-80 Model I or III cassette $18.00.

11. CELLS - Educational Activities. (Grades 3-9) Two programs. Animated graphics are used in both programs to aid in teaching about the cell. The programs contain both tutorial and drill formats. "Basic Cell Structure" - in this almost totally graphic presentation of the cell, the viewer is introduced to the basic parts of a cell (cell membrane, cytoplasm and nucleus), shown how small particles of dissolved nutrients may pass through a cell membrane while larger particles are kept out, and is shown an amoeba extending a pseudopod. A drill section completes the lesson. The program responds to incorrect answers by branching to clear and complete explanations. "Cell Division (Binary Fission)" - The subject animated view of mitosis, cell membrane expansion and pinching together, and the resulting two daughter cell.. The tutorial is followed by a drill section which utilizes branching to provide easily understandable explanation to incorrect student responses. Apple, Pet, TRS-80 cassettes $45.95, disk $49.95.

12. ELEMENTARY SCIENCE - THE ATOM AND SIMPLE MACHINES - Micro Ed. "Atom" teaches the basic principles of atomic structure. "Machines" introduces three simple machines. Graphics. Quizzes. PET, COM.64 disk or cassette $29.90.

13. SHARING SCIENCE PART 1B - Micrograms. The computer is provided with data in six or seven science curriculum categories. Three of the categories appear on the screen. The players select a catagory, and the computer responds with a true-false statement. The two players are encouraged to discuss their responses as they both answer all questions in an attempt to outscore the computer. The computer indicates whether the statement given was true or false, scores the responses and provides an explanation for each statement.

Teachers like the program structure which allows students to learn not only from the computer but from interaction with each other as well. Categories are: Hot and Cold, Plants and Animals, Water, Seasons, Light, Sound, and Magnets. This level deals with basic concepts and is recommended for 2nd and 3rd grade children. PET 16K cassette $12.95, disk $15.95, Com. 64 cassette $14.95, disk $17.95.

14. SHARING SCIENCE PART 1C - Micrograms. Similar to the above. Categories are: Simple Machines, States of Matter, The Sun and Planets, A Healthy Diet, Plants and Animals, and The Changing Earth. We recommend this program for 3rd and 4th grade students. PET 16K cassette $12.95, disk $15.95, Com. 64 cassette $14.95, disk $17.95.

15. SHARING SCIENCE PART 1D - Micrograms. Similar to the above. Categories are: Plants and Animals, Magnetism, Insects, Electricity, The Human Body, The Atmosphere. We recommend this program for students in grades 4 and 5. PET 16K cassette $12.95, disk $15.95, Com. 64 cassette $14.95, disk $17.95.

16. SENSES - Ventura. Utilizes the hi-res graphics capabilities of the Apple to prompt the user to identify the names of parts of the sense organs. The challenge in this educational game is to identify and spell the names of the basic parts of the eye, tongue, ear and skin. After the user has correctly identified a specified organ part, interesting facts about the part's function are presented. Apple disk $39.95.

Reading Skills

1. SPELLING BEE WITH READING PRIMER - Edu-Ware Services. Two programs introduce the learner to spelling and reading by linking familiar objects with words and identifying basic word groupings. The units cover simple two and three letter words; four letter, one syllable words; double vowels/consonants; hard c's and silent e's; one syllable with dipthongs; simple multi-syllable words; difficulty multi-syllable words; and directions and numbers. Apple disk $39.95.

*2. THE READING MACHINE - SouthWest EdPsych Services, Inc. Utilizes phonetic approach. 28 skill levels sample the basic reading domain: upper case letter matching, lower case letter matching, letter sequencing, beginning consonants, ending consonants, short vowels, consonant blends, long vowels, consonants diagrphs, vocabulary. There is a record keeping system which permits convenient progress reviews. The program features immediate evaluation feedback, a comprehensive management system, hi-res graphic pictures which match each word with a corresponding visual image, and large size upper and lower case letters used throughout to improve readability. Apple disk $59.95.

3. WORD FAMILIES - Hartley. This disk includes three different skill categories. The teacher may select: beginning consonant substitution, final consonant substitution, or medial vowel substitution. There are 300 separate presentations. Apple disk $29.95.

4. WHO, WHAT, WHERE, WHEN, WHY - Hartley. Fourteen lessons sequenced from easy to difficult. Each lesson contains twenty presentations on combinations of who, what, etc. Apple disk $35.95.

5. THE VOWELS TUTORIAL - Hartley. Developed under a grant from the Apple Education Foundation. The student is presented with a visual stimulus as r_t. Auditory instructions are given. "Type the missing letter you hear in the word 'rat'". If the student makes an error, the program branches to a brief tutorial. A picture is shown of a word with the same vowel sound Additional words with the same vowel sound are presented. When a rule is involved, the rule is given followed by several example words. The student then branches back to the main program. Apple (3 disks) $120.00. Cassette Control Device required ($79.95).

6. VOWELS - Hartley. Fifty-three lessons of twenty presentations each vowel long and short vowels, double vowels, diphthongs, r-controlled vowels, the schwa sound and other related skills. Teacher records the instructions and directions on tape with the use of the Cassette Control Device ($79.95) This is one of the most comprehensive drills on vowels available for the microcomputer. Back up disk included in package. Apple disk $93.05.

7. CONSONANTS - Hartley. A complete series of phonics lessons on sounds of consonants and consonant blends. Initial and final consonants are included along with initial, final and medial blends. Teacher records the instructions and directions on tape with the use of the Cassette Control Device ($79.95). Ideal to develop listening skills and to help students learn to discriminate between consonant sounds. Back up disk included. Apple disk $79.95.

8. BEGINNER READER - Intellectual Software. Four programs for the very new reader, identifying rhymes, different endings, words which don't fit. Apple, TRS-80 disk $14.95.

9. READING PROGRAM- Micro Learningware. The student must determine which of the four items listed is not like the others. If an incorrect response is given, an explanation is offered by the computer explaining why the response is incorrect. Apple, PET, Com. 64 disk $29.95. PET, Com. 64 cassette $29.95.

10. PHONICS: PROGRESSIVE SEQUENTIAL SERIES - CompEd. Eight programs offer menu type selections, large letters, and colorful graphic stimulation. Gives students two chances for the correct answer.

Errors are indicated and correct answers are rewarded with a graphic. Student workbooks, teacher utility, student records, variable speed. The eight programs are: BEGINNING CONSONANTS, ENDING CONSONANTS, SHORT VOWELS, LONG VOWELS, LONG AND SHORT VOWEL DISCRIMINATION, BLENDS, DIGRAPHS, and DIPTHONGS. Apple, Com. 64 disks $19.95 each program, all 8 for $159.60.

11. WINNING WITH PHONICS - Wise Owl. Presents the poor reader with high-frequency words already in his speaking vocabulary. Instruction begins with words with a high degree of consistency in the way in which letters represent sound. In the beginning lessons, the sound-letter correspondence is absolute: the student sees identical phonograms (vowel-consonant combinations) in several words--only the beginning consonants differ in back, black, tack, and so forth. The Teachers' Manual has a teaching plan and an indexed list of the words available in the computer program. The computer presents exercises making use of the words in each lessons. TRS-80 MODEL I or III, or COLOR EXTENDED BASIC 16K cassette $30.00. Apple, TRS-80 MODEL I, III, COLOR EXTENDED BASIC disk $35.00.

12. FUNDAMENTAL PHONICS AND WORD ATTACK - Random House. 128 Lessons offer practice exercises in eight skills: visual discrimination, letter recognition, sight words, initial consonant sounds, final consonant sounds, vowel sounds, phonetic generalizations, and syllabication. All sounds are taught in the context of a word, and all words are taught in the content of a sentence. Two characters, "Razzle and Dazzle", pronounce sounds and give students the rules they need to decode more successfully. Students simultaneously hear with tape recorder and see examples of word-attack skills. Pre and Post tests facilitate diagnosis and prescription. Headset included. TRS-80 cassettes $399.00; 48K disk $498.00.

13. 1-2 LANGUAGE PACKAGE - Little Bee. Three programs on Rhyming, Making New Words, and Matching Vowel Sound. Available separtely at $10.95 each. TRS-80 Model I or III cassette $31.95.

14. PHONICS I - Dorsett. Beginning reading skills, vowels, consonants, final sounds, short words, etc. 16 programs on 8 cassettes. Atari cassettes (require EMS cartridge, $25.00) $59.00. TRS-Color Computer cassettes $59.90.

15. PHONICS II - Dorsett. Continuation of the above - Diagraphs three letter sound combination, long vowels, etc. 16 programs on 8 cassettes - Atari cassettes, (requires EMS cartridge $25.00), $59.90, TRS-Color Computer cassettes $59.90.

16. READING DEVELOPMENT II - Dorsett. 16 programs on 8 cassettes to develop word attack skills. Beginning letters, i, a, and e sounds.Atari version require Education Master System Cartridge ($25.00) Atari, TRS-Color Computer Cassettes $59.90.

17. READING DEVELOPMENT II - Dorsett. Similar to the above, for more advanced students (Grades 2-3) 14 programs on 7 cassettes. Atari cassettes $59.90 (requires EMS cartridge $25.00), TRS-Color Computer Cassette $59.90.

18. PRIMARY PHONICS LAB - Bluestone. Aimed at primary grades 1-3. This program covers beginning and ending consonants, short and long vowels, consonant blends, digraphs, clusters, vowel digraphs, hard and soft C and G rules, and includes a record sheet ditto master. Atari Disk or Cassette, 16K, $25.00.

19. FLASHING WORD MEMORY DRILL - Bluestone. This program allows one to enter up to 25 words, with 6 flashing speeds, 3 different word sizes. For spelling and visual memory, w/ sound and graphics. Includes a record sheet ditto master and a 3 ring binder. Atari Disk or Cassette, 16K $25.00.

20. VOWELS - JMH. Five programs in recognizing and matching vowel sounds. 5 Com. 64, 16K PET, Atari cassettes; VIC-20 cassettes $39.95.

21. BEGINNING READING PACKAGE - Micrograms. 6 programs on Alphabet Song, Alphablocks, Beginning and Ending Sounds, Which Two are the Same, Alphabetical Order. PET Cassettes, 8050 disk $59.95.

22. MR. READWELL - GRADE 1 PACKAGE - Micrograms. Two programs: Each program consists of numerous short selections and corresponding comprehension questions. A reading rate may be set to control the speed at which the words are cleared off the screen. With the emphasis on comprehension rather than rate, the student is asked if he/she understood the selection before the comprehension questions are asked. If a student experiences difficulty in understanding a selection, he/she may choose to read it through again before being presented with the questions. 2 PET cassettes $25.90, PET disk $28.90. 2 Com. 64 cassettes $29.90, Com. 64 disk $32.90.

23. MR. READWELL - GRADES 1-2 PACKAGE - Micrograms. Four programs similar to the above. 4 PET cassettes $51.80, PET disk $54.80. 4 Com.64 cassettes $59.80, Com. 64 disk $62.80.

24. MR. READWELL - GRADES 2-3 PACKAGE - Micrograms. Four programs: Each program consists of numerous short selections and corresponding comprehension questions. A reading rate may be set to control the speed at which the words are cleared off the screen. With the emphasis on comprehension rather than rate, the student is asked if he/she understood the selcetion before the comprehenion questions are asked. If a student experiences difficulty in understanding a selection, he/she may choose to read it through again before being presented with the questions. 4 PET cassettes $51.80, PET disk $54.80. 4 Com.64 cassettes $59.80, Com. 64 disk $62.80.

25. SEQUENCING SAM - GRADE 1 PACKAGE - Micrograms. Two programs: Students read a given selection. The computer asks if the student understood the selection or if he/she needs to reread it. When the student feels comfortable with his/her understanding of the selection, the computer presents a series of events which the student is required to sequence. When events are sequenced incorrectly, students are required to reread the selection and correct their responses. The computer will advance to the next story selection when all answers are correct. 2 PET cassettes $25.90, PET disk $28.90. 2 Com.64 cassettes $29.90, Com.64 disk $32.90.

26. SEQUENCING SAM - GRADE 1-2 PACKAGE - Micrograms. Four programs similar to above. 4 PET cassettes $51.80, PET disk $54.80. 4 Com. 64 cassettes $59.80, Com. 64 disk $62.80.

27. SEQUENCING SAM - GRADES 2-3 PACKAGE - Micrograms. Four programs: Students read a given selection. The computer asks if the student understood the selection or if he/she needs to reread it. When the student feels comfortable with his/her understanding of the selection, the computer presents a series of events which the student is required to sequence. When events are sequenced incorrectly, students are required to reread the selection and correct their responses. The computer will advance to the next story selection when all answers are correct. 4 PET cassettes $51.80, PET disk $54.80. 4 Com. 64 cassettes $59.80, Com. 64 disk $62.80.

*28. READING AND THINKING I - Intellectual Software. Second to third grade level reading exercises requiring students to deal with inferential thinking (figuring things out) which are not explicitly stated in the passage. Four Apple, IBM PC disks $29.95 each all four for $99.95. Apple disks with sophisticated classroom management system $39.95 each, all four for $139.95.

*29. WAYS TO READ WORDS - Intellectual Software. Presents various cues for recognizing words in context, such as shape, beginnings and ends of words, and context. Also presents work on consonants, long vowels, and word endings. The skills contained in the series do not represent any one "method" of reading instruction, but rather have an eclectic approach. The emphasis is placed on helping the reader obtain and use various strategies for reading unknown words in context, strategies such as shape cues, word families, rules, context itself, etc. The major objective of the series is to help the reader use whatever cues he/she finds useful for understanding words on a printed page. The vocabulary level and the sentence structure are about third grade reading level for the series as a whole. A variety of skills and exercises for practicing basic word analysis are presented. The disks are not correlated to any specific reading series.

Nevertheless, the skills in them are presented in a manner and sequence typical of many basal programs, so they can easily be used along with the classroom reading series. The content of the disks is not grade- or age-related, and thus they are appropriate for readers of any age who need instruction or review of the skills presented. 2 Apple disks $39.95, with classroom management system $59.95.

*30. MORE WAYS TO READ WORDS - Intellectual Software. Reviews the work of the above book, and present syllabication of words, showing how to take apart words, say the syllables, and put them together again. Word endings are further explored. 2 Apple disks $39.95, with classroom management system $59.95.

*31. LEARNING ABOUT WORDS - Intellectual Software. Presents consonant combinations, prefixes, suffixes, and root words, contractions, compound words, and possessives. Also alphabetizing, parts of the dictionary, and guide words. 3 Apple disks $54.95, with classroom management system $84.95.

*32. LEARNING MORE ABOUT WORDS - Intellectual Software. Presents special vowel and consonant sounds and combinations, letter patterns, and letter combinations that sound alike. 3 Apple disks $54.95, with classroom management system $84.95.

*33. LEARNING WAYS TO READ WORDS - Intellectual Software. All 4 of the above. 10 Apple disks $189.80, with classroom management system $289.80.

34. READING COMPREHENSION GRADE THREE - Intellectual Software. Third grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks, $24.95 each, all 3 for $65.00. (PC versions - each on one disk), Apple disks with sophisticated classroom management system $34.95 each, all 3 for $95.00.

35. READING COMPREHENSION GRADE FOUR - Intellectual Software. Fourth grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00. (IBM versions - each on one disk), Apple disks with sophisticated management system $34.95 each, all 3 for $95.00.

36. THE CLASSICS SERIES - A/V Concepts. Reading levels 2-4. This series of classic novels has been adapted and rewritten at appropriate readability levels for students who find reading the original versions too difficult. Each classic novel has been adapted into ten short chapters/stories using the Contained Reading format. Each classic story is divided into 10 mini-story lessons. Each mini-story lesson stands alone and serves to stimulate continuing interest. Key Words are defined and used in context. Survey and prereading techniques are developed.

Contained Reading Story - is read on Apple II 48K in the Contained Reading Format to develop rate with comprehension. Comprehension Check - ten multiple choice questions include: Recalling Details, Critical Thinking, Making Inferences, Main Idea. Vocabulary Check - written exercises using the key words. Package I - Black Beauty, Tom Sawyer, Call of the Wild - three Apple disks $189.00. Package II - Robinson Crusoe, Red Badge of Courage, Kidnapped - three Apple disks $189.00. Package III Captains Courageous, Dr. Jekyll and Mr. Hyde, Time Machine - three Apple disks $189.00.

37. TUTORIAL COMPREHENSION - Random House. Tutorial lessons on Main Ideas, Details, Sequence, Inference, and Critical Reading. Available separately for $215.00 each TRS-80 cassette, $255.00 each Apple, TRS-80 48K disk. All five TRS-80 cassettes for $840.00; Apple TRS-80 48K disk $995.00.

38. FUNDAMENTAL WORD FOCUS - Random House. Drill on alphabetical order; syllabication; prefixes; suffixes; compound words; vowels; syllables and other word management skills. TRS-80 cassette $120.00; Apple, Atari 800, TRS-80 disk $165.00.

39. HOMONYMS IN CONTEXT - Random House. Provides drill and practice for students needing to improve their recognition of a homonym in a sentence contest. TRS-80 cassette $39.00; Apple, TRS-80 disk $60.00.

40. READING COMPREHENSION I - Random House - BLS. A comprehensive collection of 15 Apple disks, on the 3-4 grade reading level, available separately for $60.00 each: Discovering Books; Book Classics; Finding People, Places and Things; Reading Word and Letters Carefully, Using Directions to Go Places; Doing Things in Order; Read It All; Understanding What You Read; The Order of Events; Interpreting and Remembering What you Read (2 disks, $60.00); Reading Between the Lines; Think As You Read; Adding up Details; Learning About Characters. All 15 Apple 48K disks $714.00.

*41. FIGHT FOR INDEPENDENCE - Creative Curriculum. Grade 4 reading level. 20 lessons. Emphasis on reading comprehension skills. Serial tachistoscopic training, vocabulary building exercises, phrase reading. The story of one family and its descendants through various periods in American history is told in this program and in subsequent programs in this series, each at a higher grade level. 2 Apple disks $79.95.

42. THE WESTWARD MOVEMENT - Creative Curriculum. Grade 5 reading level. 21 lessons. 2 Apple disks $79.95.

43. THE WAR BETWEEN THE STATES - Creative Curriculum. Grade 6 Reading Level. 20 lessons. 2 Apple disks $79.95.

44. BUILDING THE TRANSCONTINENTAL - Creative Curriculum. Grade 7 Reading Level. 23 lessons. 2 Apple disks $79.95.

45. NORTH TO ALASKA - Creative Curriculum. Grade 8 Reading Level. 20 lessons. 2 Apple disks $79.95.

46. ALASKAN GOLD - Creative Curriculum. Grade 9 Reading Level. Apple disks $79.95.

47. OUR WEIRD AND WACKY WORLD - LITERAL COMPREHENSION - Educational Activities. Eight short stories on the computer with a follow-up practice ditto for each story. This computer assisted reading program uses the computer's capabilities to provide immediate remediation and reinforcement for poor reading students. High motivation is provided by the techniques, animated graphics and short, humorous, true-to-life stories on which the program is based. Story based activities include fill-ins, look-alikes, close practice, ordering, etc. Wrong answers elicit immediate aid by the program. Related ditto exercises stress comprehension and decoding skills. Apple, PET, TRS-80 disk $54.95 or cassette $44.95.

48. OUR WEIRD AND WACKY WORLD - CRITICAL READING PROGRAM - Educational Activities. Similar to above. Eight more short stories followed by close practice and critical understanding questions and a follow-up ditto for each story. Apple, PET, TRS-80 disk $54.95 or cassette $44.95.

49. ADVENTURES AROUND THE WORLD - Orange Cherry Media. Four program stories designed to help students develop their reading skills. Student actively participates in the adventures. Questions to monitor comprehension are placed throughout the program. Apple, PET, TRS-80 cassette or disk $67.00.

50. THE CLOZE TECHNIQUE FOR DEVELOPING COMPREHENSION - Orange Cherry Media. Certain words are deleted from reading passages. The deletions are then supplied by the pupils, who select from the alternatives provided them. Only one answer is correct when judged within the context of the entire reading selection. Apple, PET, TRS-80 cassette or disk $34.00.

*51. MR. READWELL - GRADES 3-4 PACKAGE - Micrograms. Four programs: Each program consists of numerous short selections and corresponding comprehension questions. A reading rate may be set to control the speed at which the words are cleared off the screen. With the emphasis on comprehension rather than rate, the student is asked if he/she understood the selection before the comprehension questions are asked. If a student experiences difficulty in understanding a selection, he/she may choose to read it through again before being presented with the questions. 4 PET cassettes $51.80, PET disk $54.80, Com.64 cassettes $59.80, Com.64 disk $62.80.

*52. SEQUENCING SAM - GRADES 3-4 PACKAGE - Micrograms. Four programs: Students read a given selection. The computer asks if the student understood the selection or if he/she needs to reread it. When the student feels comfortable with his/her understanding of the selection, the computer presents a series of events which the student is required to sequence. When events are sequenced incorrectly, students are required to reread the selection and correct their responses. The computer will advance to the next story selection when all answers are correct. 4 PET cassettes $51.80, PET disk $54.80. 4 Com. 64 cassettes $59.80, Com.64 disk $62.80.

53. READING COMPREHENSION GRADE FIVE - Intellectual Software. Fifth grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00. (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00.

54. READING COMPREHENSION GRADE SIX - Intellectual Software. Sixth grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00, (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00.

55. READING COMPREHENSION II - Random House - BLS. Reading Level Grade 5-6, Content level 4-7. 12 Apple diskettes, available separately at $60.00 each: Basic Library Skills; Finding the Book You Want; Graph and Map Reading; Counting Roman Numerals and Walking Directions; Words Cut and Tongue Twisters; Solving Problems by Following Directions; Related Sentences and Identification of Paragraphs; Figures of Speech, Inference Facts; Main Ideas; Title and Turning Points; and 3 disks on Understanding Paragraphs ($162.00 for all 3). Package also includes 4 test diskettes for a total of 16 Apple 48K diskettes $612.00.

*56. READING COMPREHENSION I - Milton Bradley. Recognizing topic sentences, listing supporting details, summarizing main ideas, choosing titles, and evaluating details. Apple disk $49.95.

57. COMPUTERIZED READING MACHINE - Southeastern Educational Software. The teacher selects up to fifty students individualized prescriptions for different stories, different reading speeds and reading windows. Ten **story** are provided at a grade 6 level with a comprehension test for each story; test results are stored on diskettes for retrieval at the teacher's convenience. Written records of student progress may be automatically generated. Apple disk $60.00.

*58. KEYS TO SEQUENCE - Media Materials. Can help students organize thinking, follow directions and determine how something works or why it happens. Includes 10 student workbooks, instructor's guide. Apple, TRS-80 III disk $39.95.

*59. BUILDING INFERENCE SKILLS - Media Materials. Shows students how to infer details, main ideas and conclusions and what to avoid in making inferences. Includes 10 student workbooks, instructor's guide. Apple, TRS-80 III disk $39.95.

60. ELEMENTARY READING SERIES: PACKAGE 1 - C&C Computer. Reinforces practical reading skills. Three programs on Syllabication, Base Words, and Alphabetizing. TRS-80 Model I or III, 16K cassette $24.95, disk $27.95.

61. ELEMENTARY READING SERIES: PACKAGE 2 - C&C Computer. Three programs on: Table of Contents, Fact or Opinion, and Punctuation - commas. TRS-80 Model I or III, 16K cassette $24.95 disk $27.95.

62. ELEMENTARY READING SERIES: PACKAGE 3 - C&C Computer. Three programs on: Cause and Effect, Following Directions, and Meaning of Compound Words. TRS-80 Model I or III, 16 K cassette $24.95, disk $27.95.

3. ELEMENTARY READING SERIES: PACKAGE 4 - C&C Computer. Three programs on: Prefixes, Suffixes and Synonyms and Antonyms. TRS-80 Model I or III, 16K cassette $24.95, disk $27.95.

64. ELEMENTARY READING SERIES: PACKAGE 5 - C&C Computer. Three programs on: Pronoun and Adverb referents, Simile and Metaphors, and Context for Word Meaning. TRS-80 Model I or III, 16K cassette $24.95, disk $27.95.

*65. ELEMENTARY READING SERIES - C&C Computer. All 5 of the above programs. TRS-80 Model I or III, 16K cassettes or disks $100.00.

*66. MR. READWELL - GRADE 4-5 PACKAGE - Micrograms. Four programs: Each program consists of numerous short selections and corresponding comprehension questions. A reading rate may be set to control the speed at which the words are cleared off the screen. With the emphasis on comprehension rather than rate, the student is asked if he/she understood the selection before the comprehension questions are asked. If a student experiences difficulty in understanding a selection, he/she may choose to read it through again before being presented with the questions. 4 PET cassettes $51.80, PET disk $54.80. 4 Com. 64 cassettes $59.80, Com.64 disk $62.80.

*67. SEQUENCING SAM - GRADE 4-5 PACKAGE - Micrograms. Four programs: Students read a given selection. The computer asks if the student understood the selection or if he/she needs to reread it. When the student feels comfortable with his/her understanding of the selection, the computer presents a series of events which the student is required to sequence. When events are sequenced incorrectly, students are required to reread the selection and correct their responses. The computer will advance to the next story selection when all answers are correct. 4 PET cassettes $51.80, PET disk $54.80. 4 Com. 64 cassettes $59.80, Com.64 disk $62.80.

68. FOUR BASIC READING SKILLS - BrainBank. How to Recall Details, How to Identify the Main Idea, How to Draw Conclusions, How to Put Things in Order, Review of the Four Basic Skills. Apple, Pet Disk $60.00, Pet cassettes $60.00. Four practice (A-D) programs $60.00 each, all four for $240.00.

69. READING COMPREHENSION GRADE SEVEN - Intellectual Software. Seventh grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple IBM PC disks $24.95 each, all 3 for $65.00, (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00.

70. READING COMPREHENSION GRADE EIGHT - Intellectual Software. Eighth grade level reading comprehension exercises based on the popular McCALL-CRABBS SERIES published by Teachers College Press of Columbia University. 3 Apple, IBM PC disks $24.95 each, all 3 for $65.00, (IBM version on one disk), Apple disks with sophisticated management system, $34.95 each, all 3 for $95.00.

71. READING COMPREHENSION III - Random House - BLS. Reading Level 7-8, Content level 7-10. 16 Apple disketes, available separately at $60.00 each: Information in the Dictionary; Using the Pronunciation Guide; Homographs and Homonyms; Using Meanings and Definitions; Derived and Irregular Forms; Following Oral and Graphic Instructions; Using Symbols and Automatic Machines; Codes and Arithmetic; Exercises in Following Directions; Paraphrasing Key Words and Inferences; Sentence Paragraph Relations; Facts Relating to Paragraphs; Words and Paraphrases; Main Facts and Key Ideas; Inferences Purposes and Conclusions (2 disks $60.00) All 16 Apple 48K disks $816.00.

72. READING COMPREHENSION IV - Random House - BLS - Reading level 9-10, Content level 8+. 13 Apple disks available separately for $60.00 each: Choosing a Topic; Selecting Appropriate Informations; Using the Encyclopedia; Finding Sources - The Card Catalog and Reader's Guide; Paraphrases, Inference and Point of View B; Symbols and Directions; Paraphrases, Inference and Point of View C; Source of Reference; Using Internal and External Evidence; Assumptions and Elements of Humor; Theme Style and Metaphor (2 disks $60.00) and Implication, Attitude, Symbolism, Image and Onomatopoeia. All 13 Apple 48K disks $663.00.

*73. RETURN-TO-READING - Media Basics. Programs which interact with students after they have read the book. Programs include: Responding to the Book - Exploring Feeling, and Making Connections. Understanding the Book - Reviewing the Story; Understanding the Story: Finding Main Ideas, Determining Sequence, Analyzing Characters, Recalling Details; Thinking about the Story: Determining Mood and Emotion, Identifying Point of View, Establishing Cause/Effect, Making Comparisons, Separating Fact from Opinion, Making Predictions, Drawing Conclusions; Understanding the Author's Language: Selecting the Proper Word, Selecting the Best Meaning, Finding Synonyms and Antonyms, Understanding Figurative Language. Going Beyond the Book - Activities: Scramble, Tic Tac Toe; Enjoying Other Books. Getting Involved - Warm-up exercises encourage students to think about the book they have read. Measuring Performance - Diagnostic test measures atudent performance in these key areas: General Reading Comprehension, Understanding the Basic Book, Mastering Language Skills. Building a Reading Habit - Follow-up exercises stimulate student interest in reading other books for pleasure and enrichment. Bonus Questions- Unique branching techniques reware achievement and encourage further learning.

Books now available: The Adventures of Tom Sawyer, The Adventures of Huckleberry Finn, Animal Farm, The Black Stallion, The Call of the Wild, A Day No Pigs Would Die, Diary of Anne Frank, Fahrenheit 451, The Good Earth, The Great Brain, Great Expectations, The Hobbit, Julius Caesar, To Kill A Mickingbird, Lord of the Flies, The Miracle Worker, 1984, The Pearl, The Pigman,A Raisin in the Sun, The Red Badge of Courage, The Red Pony, Romeo and Juliet, A Tale of Two Cities, Where the Red Fern Grows. Books available November, 1983: All Quiet on the Western Front, Billy Budd, Born Free, Brave New World, Charlies and the Chocolate Factory, The Chocolate War, Cry the Beloved Country, Dracula, The Effect of Gamma Rays on Man-In-The-Moon Marigolds, A Farewell to Arms, Flowers for Algernon, Giants in the Earth, The Gift of the Magi/The Ransom of Red Chief, The Heart is a Lonely Hunter, Of Human Bondage, Johnny Tremain, The Lion the Witch and the Wardrobe, The Little Prince, The Martian Chronicles, The Odyssey, One Day in the Life of Ivan Denisovich, A Separate Peace, The Telltale Heart/The Cask of Amontillado, White Fang/To Build a Fire, Wuthering Heights. Apple disk $70.00 each; Starter Set - Any 5 titles $295.00; Mini-Library - Any 10 titles $550.00; Basic Library - Any 20 titles $995.00.

74. READING COMPREHENSION I - Dorsett. 16 stories: Leah's House, Sacajawea, The Star Travellers Wycoming Journal; The Deep Blue Capter, Recovery, Surfing, Continental Drift, Adventurer, The Great One, The Year of the Artist, Aaron Burr, The Heroic Age, Civil War Soldier, Jelly Roll and The Inventor. Atari, TRS-80 cassettes $59.00.

75. READING COMPREHENSION II - Dorestt. 16 stories: Julius Caeser, MacBeth, Invanhoe, The Grapes of Wrath, Mutiny on the Bounty, A Tale of Two Cities, Robinson Crusoe, Last of the Mohicans, Moby Dick, David Copperfield, Don Quixote, The War of the Worlds, The Three Muskateers, 20,000 Leagues Under the Sea, The Red Badge of Courage, William Tell, and Treasure Island. Atari, TRS-80 cassettes $59.00.

76. READING COMPREHENSION III - Dorsett. Reading material on auto mechanics: checking out a used car; overhauling the car's engine; increasing the car's performance; facts about the car's mechanism; terms a mechanic uses; the car's electrical system; the automobile mechanic career; the mechanic and his tools; safety in the shop, color code; the diagnostic center; engine displacement in cubic inches; converting to the metric system; mileage, fuel performance; computing changes and labor costs; replacing a burned out fuse; and credit interest, paycheck deductions. Atari,TRS-80 cassettes $59.00.

77. READING COMPREHENSION I-IV - Dorsett. Reading materials on general shop practices: tool identification; fasteners and hardware; proper lubricant for small engines; performing periodic services; operation of the four-cycle engine; discussion of a two-cycle engine; use of micrometers and calipers; measuring, marketing, cutting metal; soldering electrical connections; the actylene torch, safety rules; cutting and welding; electric arc welding, terms, types unsafe situations, preventions; employment hints; and discussion of business etiquette. Atari, TRS-80 cassettes $59.00.

*78. PAL - Universal Systems for Educational Inc. Uses a diagnostic/remediation approach to teaching reading. Covers the entire scope of reading education for grades 2 through 6. The curriculum has been developed through seven years of field testing, and has been validated against the top seven textbook reading series in the United States. Diagnoses the specific deficiencies in a student's reading ability, and prescribes remediation exercises directly targeted at the problem diagnosed. Evaluates up to 40 major reading skills and up to 160 subskills per grade level. Uses a friendly, personalized approach that is non-threatening to the poor reader. A primary emphasis is allowing every student to experience success. Consists of two parts: The Master Disk operates all the grade level programs, and will also run the PAL language arts and mathematics curriculums to be introduced later this spring. The Master Disk contains an upper/lower case chip for the Apple II, which allows Apple disk. Master disk $99.95. Reading packages, grades 2-6, $99.95 each.

79. LANGUAGE/READING DEVELOPMENT PROGRAM - Software Technology for Computers. A language and reading program appropriate for the adult. Its objectives are: develop speed while maintaining and improving perception skills, increase concentration habits, promote spelling and precise response procedures, develop vocabulary through word recognition, expand vocabulary through drill exercises exploring synonyms and antonyms and transfer qained speed, word recognition and expanded vocabulary to the solving of analogies. Features include, musical reinforcement option, 995,000 potential combinations, on multiple choice selection and 150 pages of loose-leaf instruction manual worksheets, study guides and word lists. Apple Disk $175.00.

*80. READING SKILLS LAB - NTS. The most comprehensive reading package on the market. RSL is available for each grade, levels 1 to 9 and helps develop skills in a variety of areas necessary to good reading. The programs for each grade level use a core vocabulary list containing words which occur most frequently in the most widely-used basal reading series in public school systems today. Also included in each set are original short stories. These stories have been selected for high interest value, and are matched to the reading level of each set. Each story is presented with its own set of exercises relevant only to that story. These exercises can be used to complement a language arts program by providing additional practice in using the core vocabulary words at each grade level. This repetition and reinforcement will help students acquire the language development skills needed as they progress from level to level. In addition to the presentation of the exercises on the computer screen, each program has an optional printer module that allows the teacher to prepare printed exercises for use by students away from the computer. These exercises are similar to the main exercises in each program, and may be used in a variety of ways. The teacher may request a single copy of any printed exercises, or an entire classroom set. An option allows the teacher to specify whether all copies in the classroom set should be identical, or each one different from the others. If desired, the computer will randomly choose items from the exercise list in order to provide a distinct exercise for each student. TRS-80 Model III disk Grade Levels 1-3 $350.00, Grade Levels 4-6 $350.00, Grade Levels 7-9 $350.00. Complete set Grade Levels 1-9 $1000.00.

81. PROFESSOR SNEAD - Micrograms. Professor Snead lectures on the advantage of reading rapidly but explains also that rate is secondary to comprehension. He allows the student to select a reading rate before presenting each of 9 story segments. Each segment is in turn followed by comprehension questions. Professor Snead will indicate how many questions were missed without directing the student to specific errors. The segment must be reread and the questions correctly answered before progressing to the next story part. Four packages: Grade 5-6, Grade 6-7, Grade 7-8, Grade 8-9. Each package consists of 3 cassettes or one disk. Package prices: PET cassettes, $38.85, disk $41.85, Com.64 cassettes $44.85, disk $47.85.

82. STEPS TO ADVANCED READING - SPEED READING COURSEWARE - Creative Curriculum. Utilizes serial tachistoscopic training and expanded line training to develop wider peripheral vision resulting in fewer eye movements. This is not courseware in how to "skim". The goal - a reading rate in excess of 500 words per minute - or, an improvement of 2 1/2 times, while maintaining 100% comprehension. High interest and motivational levels are maintained through use of informative articles. Includes 20 programmed reading lessons, supplemental reading book, pre & post tests, answer sheets and storage binder. 2 Apple disks $99.00.

83. RAPID READING - Silicon Valley Systems, Inc. Rapid Reader can be used with five different reading options: words, word pairs, phrases, short sentences and long sentences. It has five word banks: English, Spanish, and three user modifiable word banks. Rapid Reader can display up to two thousand wpm and generate 20 billion different sentences. Apple, Atari disk $39.95.

84. IN A FLASH - Micrograms. In this tachistiscope approach to reading, phrases are flashed on the screen at a controlled speed. Following each of 18 story segments, randomly selected questions are asked to test comprehension. A summary of student performance is provided. 16K PET cassettes, Grades 6-8 $59.95.

Mathematics

1. INTRODUCATION TO MATHEMATICS ON THE COMPUTER - Educational Activities. "Marvelous, wide-ranging program". Creative Computing, designed for slow learners, covers addition, subtraction, multiplication and division. Pet, TRS-80 cassette $39.95, Apple, PET, TRS-80 Atari disk $49.95.

2. MORE THAN TEN - Microcomputer Workshops. This program is designed to help the student understand addition and subtraction when the sum is more than ten or the difference is the result of subtracting from a number more than ten. The student uses the computer to move dots on the screen so that sets of ten are either created or broken apart to identify a sum or difference. He/she can see the number of dots remaining to establish the correct answer. The student is then asked to solve an appropriate abstract example without the use of the dots. Pet cassette $20.00, Apple disk $39.95.

*3. SUBTRACTION - Microcomputer Workshops. Practice in subtraction with the option of borrowing is offered in this program which allows the student to choose the amount of digits in each number. Problems are generated randomly with different problems presented each time the program is run. Apple, TRS-80, PET, Con 64, Atari disk $24.95, TRS-80 16K, PET 8K, Com 64, Atari cassettes $20.00.

4. STORY PROBLEMS IN ADDITION AND SUBTRACTION - Micro Ed. Drill and practice on word problems. PET, Com 64 cassette $7.95, disk $10.95, TI 99/4 Ext. Basic cassette $9.95, disk $12.95.

5. MATHEMATICS WORD PROBLEMS GRADE 1 - Intellectual Software. Working with word problems, each problem fully explained, 2 Apple disks $39.95.

6. MATHEMATICS WORD PROBLEMS GRADE 2 - Intellectual Software. Working with word problems, each problem fully explained, 2 Apple disks $39.95.

7. NUMBER WORDS-LEVEL 2 - Hartley. Ten lessons of twenty presentations each cover number words from one hundred to one million. Lessons are carefully graduated in difficulty to help the child learn this content area. Students are presented with the written number. Apple disk $29.95.

8. EXPANDED NOTATION - Hartley. A numeral is presented in expanded form e.g. 4 thousands + 3 hundreds + 6 tens + 2 ones =, and the student must write the numeral. Place value is also introduced. Ten lessons of twenty presentations each may be selected. Skills begin with simple presentations of TENS and ONES. The lessons then build to THOUSANDS, HUNDREDS, TENS and ONES. Apple disk $29.95.

9. MATHEMATICS - GRADE 3 - Intellectual Software. More about adding and subtracting - How to multiply - How to divide - What third means - What dollars and half dollars are - How to use a dollar sign - More about calendars - More about thermometers - How to tell time at five minute intervals - How to measure with a ruler. 4 Apple disks, $79.95, with classroom management, $119.95.

10. MATHEMATICS - GRADE 4 - Intellectual Software. How to count up to 100,000 - How to add and subtract three-place numbers - How to multiply a three-place number - How to divide a two-place number - How to write fractions - More about thermometers - What Roman numerals are - How to work with money up to five dollars - How to use inches, feet, and yards - How to use pints, quarts, and gallons - How to use pounds and ounces - More about clocks and calendars. 4 Apple disks, $79.95, with classroom management,$119.95.

11. MATHEMATICS - GRADE 5 - Intellectual Software. What fractions are (what fraction menas) - How to work with fractions - More about adding and subtracting - More about multiplying and dividing - More about Roman numerals - More about money - What average means - More about clocks and calendars (more about time) - More about weight - More about length. 4 Apple disks $79.95, with classroom management, $119.95.

12. MIXED NUMBERS - Milton Bradley. Program includes readiness skills, addition, subtraction, multiplication, and division of mixed numbers. Apple disk $49.95.

13. BASIC SKILLS IN MULTIPLICATION - Love Publishing. Assessment branches the student to the part of the program that matches their needs. The screen shows a numerical and pictorial representation of a problem. The child is allowed a second chance after a wrong answer, after which the computer works the correct solution. A student record-keeping system tells how many practice levels the child has worked, shows all scores on tests, and can be printed. An asteroid math game is a reward for completing each level. 3 Apple disks, set of spirit masters, instructor's manual $125.00.

14. BASIC SKILLS IN DIVISION - Love Publishing. Similar to the above. 3 Apple disks, set of spirit masters, instructor's manual. $125.00.

15. DIVISION SKILLS - Milton Bradley. Program includes 90 basic facts, one-digit divisors, two-digit divisor, whole number remainders, fractional remainder, and decimal remainders. Apple disk $49.95.

*16. ADDITION WITH CARRY - Microcomputer Workshops. Step by step approach. The cursor located the position of each entry. Errors are immediately flagged enabling the student to enter new answer. The correct answer is given if second error is made. Good reviews. Apple, TRS-80, PET, Com. 64, Atari cassettes $20.00.

*17. 1 2 3 DIGIT MULTIPLICATION - Microcomputer Workshops.Multiply a 3 digit number by a 1, 2, or 3 digit number. Step-by-step, the student is taken through the multiplication and addition process. Apple, TRS-80, PET, Com.64 Atari disk $24.95, TRS-80, 16K, PET 8K, Com.64, Atari cassettes $20.00.

*18. LONG DIVISION - Microcomputer Workshops. Randomly generated problems designed by the student who chooses a 1, 2, or 3 digit divisor may be solved one step at a time. Immediate error feedback is given at each step and two chances for correction are offered before the correct answer is provided. The cursor locates the position of each entry simulating work being done on paper, heightening the learning experience resulting from the student's interaction with the computer. Outstanding reviews. Apple, TRS-80, PET, Com. 64, Atari disk $24.95, TRS-80 16K PET 8K, Com.64, Atari cassettes $20.00.

19. READ AND SOLVE MATH PROBLEMS - Educational Activities. A progressive tutorial and drill program that teaches your students the important elements of word problems and the conversion of written problems to number problems. The program allows interaction between the student and the computer, provides reinforcement of all concepts and reteaching where necessary. Interesting animated graphics regard the student when he/she is correct. The program is self-scoring and will not allow the student to progress to higher level concepts until the previous lesson has been mastered. Included with the program are ten reproducible activity masters to reinforce concepts and four reproducible activity masters for a pre and post test. Pet, TRS-80 cassettes $89.00. Apple, PTS, TRS-80 Atari disk $98.00.

20. EVERYDAY MATH: THE PROBLEM SOLVING PROCESS - MCE. This program tests the ability to analyze and check math problems faced in everyday life. Based on test results, instruction is provided in these concepts at an appropriate ability level for each learner. Interactions allow the learner to apply these problem solving processes to shopping situations and travel planning. Special features include branching (four reading levels, 2-7 grades); tutorial, simulation and problem solving formats; color graphics; optional teacher control of printing speeds and level of presentation. Apple disk $44.95.

21. EVERYDAY MATH: SOLVING ADDITION AND MULTIPLICATION PROBLEMS - MCE. This program provides the processes and experiences necessary to solve addition and multiplication problems found in everyday life. By interacting with the computer, learners receive practice in solving their own addition and multiplication problems. See #1 for special features. Apple disk $44.95.

22. EVERYDAY MATH: SOLVING SUBTRACTION AND DIVISION PROBLEMS - MCE. This program provides the processes and experiences necessary to solve subtraction and division problems found in everyday life. By interacting with the computer, learners receive practice in solving their own subtraction and division problems. See #1 for special features. Apple disk $44.95.

23. EVERYDAY MATH: SOLVING MULTIPLE STEP PROBLEMS - MCE. This program provides the processes and experiences necessary for using addition, multiplication, subtraction and division in combination to solve multiple step problems found in everyday life. By interacting with the computer, learners receive practice in solving their own multiple-step problems. See #1 for special features. Apple disk $44.95.

*24. PROBLEM SOLVING IN EVERYDAY MATH SERIES - MCE. All of the above plus additional supportive materials. 4 Apple disks $165.00.

25. MONEY MANAGEMENT: BASIC MATH SKILLS TEST - MCE. This program assesses learner's skills in using addition, subtraction, multiplication and division to solve basic math problems dealing with money. Designed for diagnosis and prescription, this program is suitable for pre-testing and or post testing. Beyond specifying correct and incorrect responses, the program analyzes learner mistakes to identify the error within the process needing remediation. Apple disk $44.95.

26. MATHEMATICS WORD PROBLEMS GRADES 3-4-5 - Intellectual Software. Working with word problems, each problem fully explained, 2 Apple disks per grade. $39.95 per grade.

27. PROBLEM SOLVING IN MATH - Bertamax. Students learn to solve problems in math using a variety of types - of lesson materials. Mystery stories to solve, practice in learning clue words, solving problems without numbers, calculator-type activities to solve word problems, and printed lesson materials. Controlled levels of difficulty, controlled levels of mathematical computation, controlled vocabulary, teacher directed activities, motivational printed material accompanies each lesson and extensive teacher's manual. Problem solving strategies taught include: Trial and Error at Level 3, Systematic Trial and Error at Level 4, Decision Trees at Level 5, and Sub-Goals at Level 6. Each grade level contains 60 lessons in 22-16K programs. TRS-80 16K cassette, Model III disk $199.50 per grade level, Apple II disk $215.50 per grade level. Specify grade level.

28. SOLVING WORD PROBLEMS I - Aquarius (Grades 3-5 reading level) Tutorial instructs students in the use of a step by step procedure for solving word problems. All problems are consistent with the functional literacy basic skills tests in mathematics. Problem solving steps are randomized to allow for repeated program use with a unique learning experience each time. Apple & TRS-80 disk $29.95, TRS-80 cassette $24.95.

*29. MATH WORD GAMES - McGraw-Hill. This 6-program package builds skills in solving math word problems. The program illustrates the problem to be solved---the student determines the correct operation to be used, and solves the problem. Reading level is controlled at or below the level of math content. Apple, TRS-80 Model III disk $38.25, PET cassette $38.25.

30. STORY PROBLEM PRACTICE IN ADDING, SUBTRACTING, MULTIPLYING AND DIVIDING - Micrograms. Recommended for grades 4-6. Story problems with randomly generated variables provided practice for either 1 or 2 players. Students are reminded to read carefully to find the facts, look for what is being asked, decide how to solve the problem, work carefully, and to check to see if their answer makes snese. Two PET cassettes $25.90, PET disk $28.90, Two Com. 64 cassettes $29.90, disk $32.90.

31. PRESCRIPTIVE MATH DRILL - Hartley. The teacher enters the names of the students into the file. He/she then sets the level at which the students are to begin work. The teacher also decides what percent accuracy is necessary to advance to another level. Number sentences are presented horizontally 3x6=. After the student has completed 20 randomly presented problems at the prescribed passing level, the computer automatically moves the student to the next higher level, the computer allows the teacher excellent control. All records can be printed at any time or viewed by the teacher on the video. Back up disk included in package. Apple disk $79.95.

32. DIAGNOSTIC PRETEST SERIES - Scandura. Determines which kinds of problems students can or cannot solve. These dramatic savings in test-time are accomplished by analyzing the underlying cognative processes. Independently, the system assesses student mastery of basic facts. Manual (It's really necessary) $20.00, ADDITION PRETEST, SUBTRACTION PRETEST, MULTIPLICATION PRETEST, DIVISION PRETEST, Apple disks $35.00 each; COMPLETE DIAGNOSTIC PRETEST SERIES: all 4 programs binder and manual, 4 Apple disks $135.00.

*33. TUTORIAL SERIES - Scandura. Interactive tutorials on three levels of instruction. First, the student is told how and required to carry out each process explicitly. Next, the student demonstrates mastery of the process without tutorial guidance but with immediate corrective feedback. Finally, the student is required to describe the steps of the process. Manual $20.00, TUTORIAL ADDITION; TUTORIAL SUBTRACTION; TUTORIAL MULTIPLICATION; TUTORIAL DIVISION; Apple disks, $35.00 each. Complete TUTORIAL SERIES: all four programs, binder, and manual, 4 Apple disks $135.00.

34. MEANING SERIES - Scandura. Step by step instruction on the meaning of computational algorithms. Expanded format allows students to see the how and whys of place values. The knowledge gained is the applied to process. Manual, $20.00. ADDITION MEANING, SUBTRACTION MEANING, MULTIPLICATION MEANING, DIVISION MEANING; Apple disks $35.00 each. COMPLETE MEANING SERIES: all four of the above, binder, and manual, 4 Apple disks $135.00.

35. SKILL DEVELOPMENT SERIES - Scandura. Designed for the student who already knows the whole number algorithm for each process. The student is taught short-cuts, how to do work in his or her head. Drill and practice included. Manual $20.00, SKILL DEVELOPMENT, ADDITION; SKILL DEVELOPMENT, SUBTRACTION; SKILL DEVELOPMENT, MULTIPLICATION; SKILL DEVELOPMENT, DIVISION; Apple disks $35.00 each. COMPLETE SKILL DEVELOPMENT SERIES: all 4 of the above, binder and manual 4 Apple disk $135.00.

36. MASTERY TEST SERIES - Scandura. Administers mastery tests on the meaning, process, verbal understanding, and short cuts of each process. Periodic review included. Each student's performance is analyzed and recorded in management system. Manual, $20.00. ADDITION MASTERY TEST SUBTRACTION MASTERY TEST, MULTIPLICATION MASTERY TEST, DIVISION MASTERY TEST. Apple disks $35.00 each. COMPLETE MASTERY TEST SERIES: all 4 of the above, binder, and manual, 4 Apple sisks $135.00.

37. RETENTION POSTTEST SERIES - Scandura. Provides an effecient means of assessing retention of how to solve various kinds of whole number addition problems. The system presents only those types of problems necessary for assessing each students abilities. Maintains complete records and can provide hard copy. Manual, $20.00. RETENTION POSTTEST, ADDITION; RETENTION POSTTEST, SUBTRACTION; RETENTION POSTTEST, MULTIPLICATION; RETENTION POSTTEST, DIVISION; Apple disks $35.00 each. COMPLETE RETENTION POSTTEST SERIES: all 4 of the above, binder, and manual, 4 Apple disks $135.00.

*38. TUTORIAL SERIES IN WHOLE NUMBER ARITHMETIC - Scandura. All six of the above series are included in this complete package. It is an "intelligent" teaching system in which appropriate testing, instructional, and branching decisions are made automatically based on what the learner knows at each stage. Complete student records up to 240 students are automatically maintained and analyzed. Selection of content and progress criteria can be controlled by the teacher. 24 Apple disks (see individual descriptions above) $600.00.

39. THE APPLE-BASED ELEMENTARY MATHEMATICS CLASSROOM LEARNING SYSTEM - SET 1 - WHOLE NUMBERS - Sterling Swift. 6 disks with lessons on Whole Numbers, Addition, Subtraction, Multiplication, Division, Games and Documentation. Learning management system. Disks begin with a Diagnostic placement test which generates a profile of the student and places him/her in the appropriate lesson. One set of lesson disks will maintain records of up to 200 students. (5 classes of up to 40 students each). 6 Apple disks $495.00.

40. MISSING MATH FACTS - Educational Activities. Addition, subtraction, multiplication and division with a twist - the answer is given but one of the components is missing. Excellent drill, four levels of difficulty. Apple, Pet, TRS-80, Atari disk $39.95. PET, TRS-80 cassette $34.95.

41. MATH BID - Micro Ed. An achievement motivation game - student must bid on his/her ability to solve problems in addition, multiplication, subtraction and division. Excellent reviews. VIC-20 5K cassette; PET, Com.64 cassette or $7.95, disk $10.95.

42. SPEED FACTS - JMH. Speed competition in addition, subtraction, multiplication and division, choice of level of difficulty. 2-5K VIC-20 cassettes $15.00; 16K PET, Atari cassette $9.95.

43. MATH FACTS - JMH. Timed drill and practice in four functions. 2-5K VIC-20 cassettes $15.00; 16K PET, Atari cassette $9.95.

44. MATH PACKAGE - K8 Software. Five programs on addition, subtraction, multiplication, division, inches, feet,yards and miles; word problems involving adding and subtracting; and word problems involving multiplication and division. 5 PET, VIC-20 cassettes $59.95.

45. RAND-O-MATH - Bluestone. (Grades 1-6). This covers random math problems as long as one likes, addition, subtraction, multiplication, division, 1 to 4 digits, scoreboard, sound and graphics, and includes a record sheet master. Atari Disk or Cassette 16K. $25.00.

*46. MATH IDEAS WITH BASE TEN BLOCKS - Cuisenaire. This program extends the use of base ten blocks to the pictorial level through vivid displays of the place value. The diskette reinforces counting, comparing, addition, subtraction, multiplication, and division, with particular attention to the transition to paper and pencil work. A full-illustrated, 38 page booklet provides instructions and black-line master assignment record sheets. Apple disk $49.95.

*47. FIGURE FUN - Sunburst. (Formerly MECC Elementary Volume 1). Number Games and Drills. Eleven math games and drills. Place values, metric conversion, approximating, estimating, prime factors, arithmetic and other basic numeric concepts and skills are covered in intriguing games. Extensive teacher's guide describes each program, lists the learning objectives, presents lesson plans, illustrates sample runs and includes reproducible worksheets for student use. Apple disk $30.00.

48. MEASURING UP - Sunburst. (Formerly MECC Elementary Volume 10). Quadrilaterals, Area and Perimeter. Four skillbuilding programs introduce students to basic geometric shapes. "Quadrilateral?" makes use of graphics and follow-up questions to show how parallelograms, rectangles, squares, rhombuses and trapezoids differ from each other. "Area and Perimeter" explores the properties of geometric shapes. Both tutorials end with a quiz that scores students on randomly selected questions. If more than two questions are missed, the student is directed to seek help. Extensive documentation. Apple disk $30.00.

*49. UNDERSTANDING POINTS AND ANGLES - Sunburst. (Formerly MECC Elementary Volume 8) Geometry Basics. "Points" defines points, lines, and segments. "Angles" explains rays, angles (Straight, right, obtuse, acute) and degrees. Graphics and questions reinforce their meaning. Extensive documentation. Apple disk $30.00.

*50. UNDERSTANDING LINES AND TRIANGLES - Sunburst. (Formerly MECC Elementary Volume 9). Geometry Basics. A dynamic introducation to two basic geometric concepts, using tutorials, graphics, drill and review. "Lines" explains parallel, perpendicular and intersecting elements in terms of lines, segments and rays. "Triangles" defines the triangle and its variations: right, obtuse, acute, isosceles, scalene, equilateral and equinangular. Extensive Documentation. Apple disk $30.00.

51. ELEMENTARY MATH STEPS - Microcomputer Workshops. Generates single digit problems in addition, subtraction, and multiplication. If an answer is correct, a happy face appears and winks. An incorrect answer receives a sad face with the nose wagging back and forth. The student has two more tries to answer correctly before the answer is given. Com. 64 version contains color and sound (option). Com. 64 disks $24.95, cass. $20.00 PET disk $24.95, cass. $20.00.

52. MATHLETICS - ABS Software. Designed and developed to improve the operator's skills in the basic arithmetic operations of addition, subtraction, multiplication, and division. The user can customize each drill to fit his needs and abilities. He may select the arithmetic operations to be drilled, the number of problems, the range of numbers from which the problems will be selected, and the number of incorrect attempts at the answer that are allowed before the problem is marked wrong. Three special modes of operation are provided: random computer selection, preschool mode, and repeat mode. Each drill is personalized with the name and score of the user. IBM PC disk $34.95.

53. BASIC MATH SYSTEM H - Mathware. A set of five independent disks covering 2nd through 8th grade math curriculum. Designed for home use, each disk contains complete instructions on use of particular keys and answer formats, daily record storage, and more than 35 completely different teaching modules which can teach concepts entirely new to the student, as well as provide review and drill. The five disks are: Addition and Subtraction; Multiplication and Division; Fractions Concepts and Operations; Decimal Concepts and Operations; and Ratios, Percents and Negative Integers. Initial difficulty levels can be selected and are automatically adjusted as the student procedes. Apple disk $345.00. Available as five separate disks $60.00 each.

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